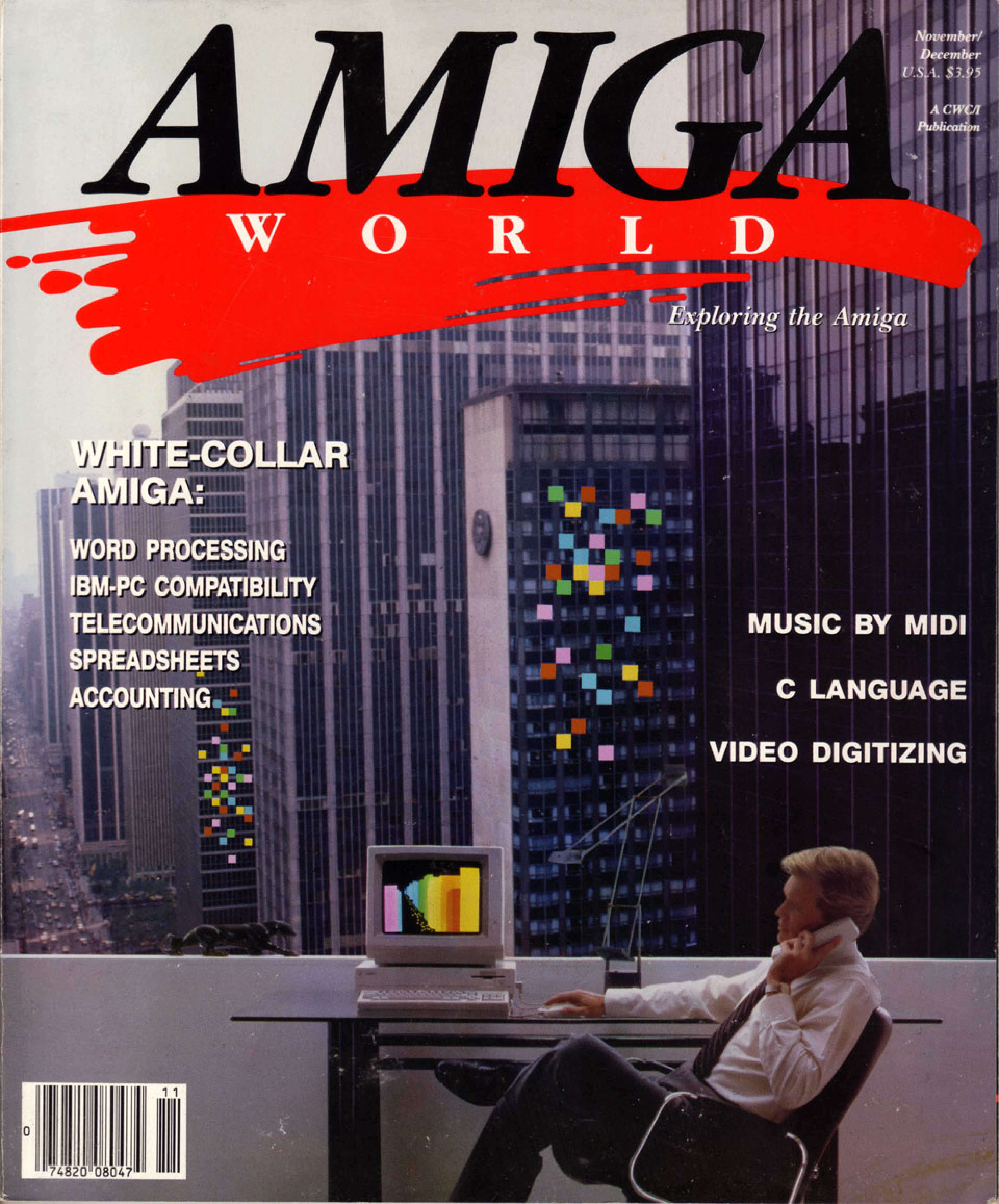
AMIGA WORLD

November/
December
U.S.A. $3.95

A CWC/I
Publication

Exploring the Amiga



WHITE-COLLAR AMIGA:

WORD PROCESSING
IBM-PC COMPATIBILITY
TELECOMMUNICATIONS
SPREADSHEETS
ACCOUNTING

MUSIC BY MIDI

C LANGUAGE

VIDEO DIGITIZING


Tecmar
T-modem
300/2400
Tecmar
T-tape
20MB
Tecmar
T-disk
20MB
Tecmar

AMIGA WORLD

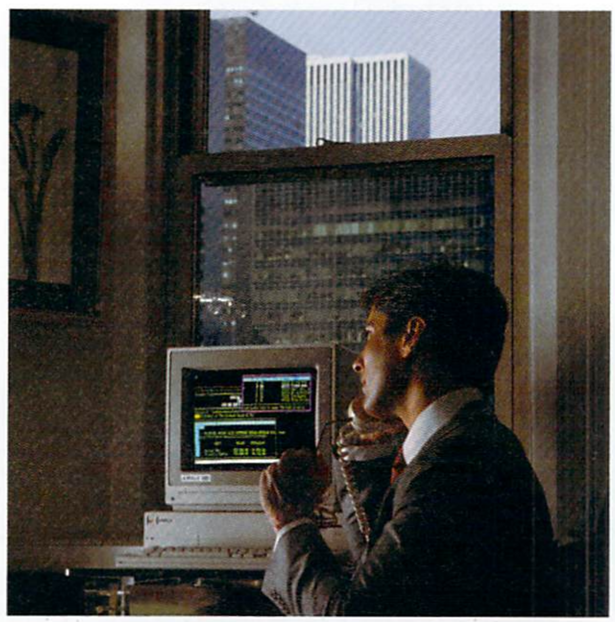
Volume 1, Number 2, ***November/December*** *1985*

Features

Articles







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Columns

Departments

AMIGA WORLD

Volume 1, Number 2, ***November/December*** *1985*

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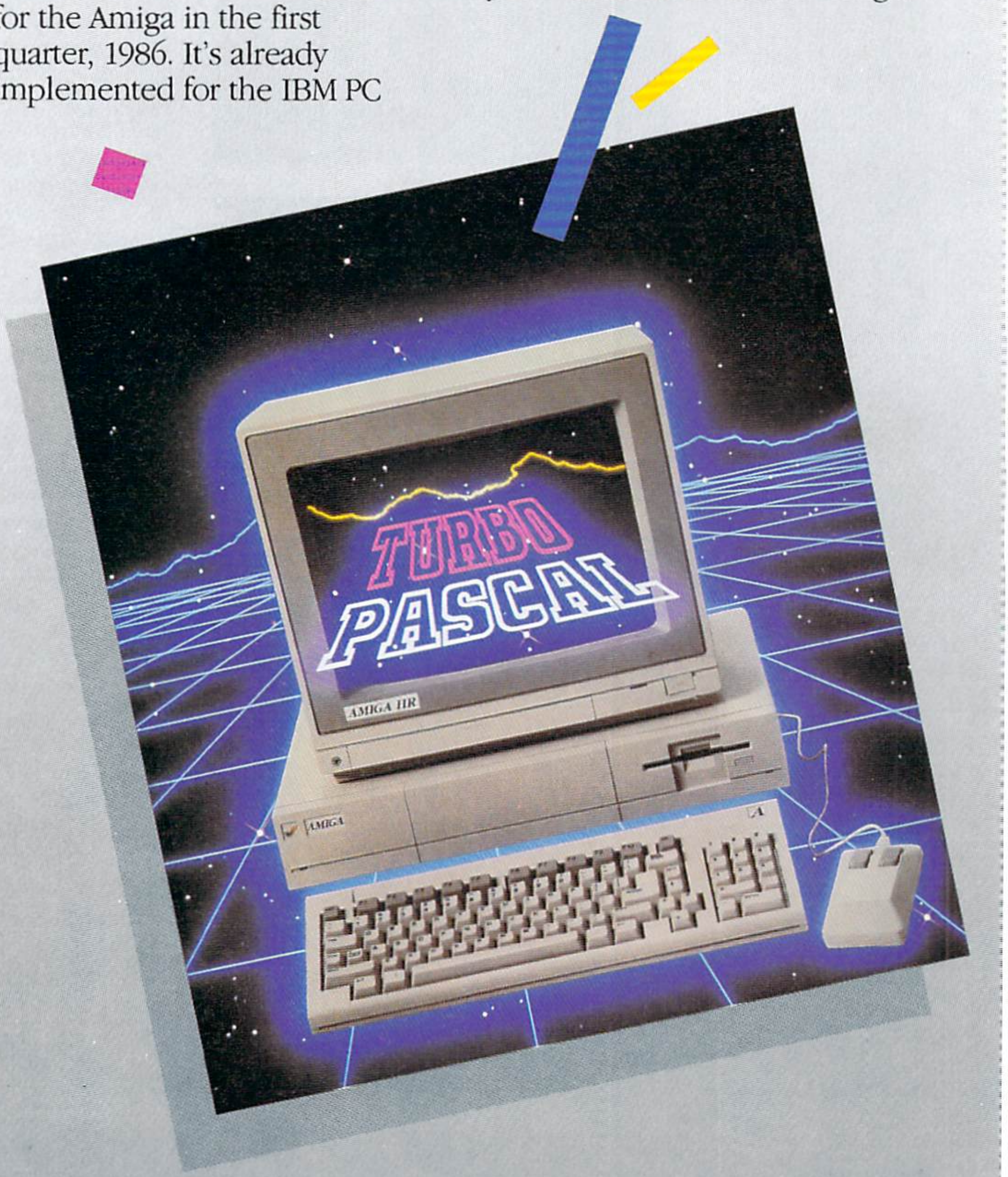
How Borland's Turbo Pascal™ Found A Partner That Matches Its Amazing Speed.

Turbo Pascal meets the Amiga™.
Turbo Pascal™ hates to wait. With Turbo, it's 'go fast' or 'go away'. So before we committed to becoming the exclusive Pascal programming language for Commodore's new Amiga, we had to be sure that it was up to speed. It had to be fast—and it is. 68000-based, with custom chips and graphics, Amiga doesn't dawdle. (In fact, Amiga's speed is going to be a headache, a heartache and a headwind to the Competition.)

We think Amiga will take off—just like Turbo Pascal did. With more than 400,000 users world-wide, Turbo Pascal has become a de facto standard—and grown into a complete Turbo 'family'. A family that now includes Turbo Database Toolbox™—a Turbo Pascal enhancement with fast data access and sorting talents; Turbo Graphix Toolbox™—a set of graphics procedures keyed to business, scientific and engineering applications; and Turbo Tutor™—the one tutorial that will take beginners and make them experts, AND will even teach a few things to the experts!

Turbo Pascal and all its associated tools, will be available for the Amiga in the first quarter, 1986. It's already implemented for the IBM PC family and IBM-compatibles, and other microcomputers from Texas Instruments™, Hewlett Packard™, DEC™, Wang™, Apple® and NCR™.

When you're faster than anyone else, you look for someone who can keep up with you. Turbo Pascal found Amiga.



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Avision

By Steve Twombly

Synergism







Imagine yourself at Lincoln Center, New York City, in formal dress. You are standing amidst a sea of tuxedos and evening dresses. No, you are not attending a ballet at the New York City Theatre or an opera at the Met. You are attending the world premiere of Amiga at the Vivian Beaumont Theatre.

On July 23, 1985, the Amiga personal computer premiered with a stellar performance to an audience of press, software and hardware developers, Commodore shareholders, members of the investment community, computer dealers and celebrity followers. The star of the evening was the new Amiga itself, which gave a dazzling display of its capabilities.

While the Amiga's performance stood alone as the evening's highlight, there was a strong supporting cast. Among Commodore officers, Irving Gould, Marshall Smith, Thomas Rattigan, Robert Truckenbrod and Robert Paradisso were present; speakers and performers also included world-famous artist Andy Warhol and highly-acclaimed musicians, Michael Bodicker and Tom Scott.

The Amiga debut unfolded like a symphony, with an exposition, development and recapitulation, presenting a rich variety of constrasting themes: the juxtaposition of art and science, imagination and technology, creativity and productivity, power and grace. With the Amiga, contrasting elements merge into an elegant and synergistic whole.

Will you use your Amiga for a variety of tasks as the ultimate multifunction machine, or will you use the Amiga as your most advanced computing tool in just one specialized discipline? At the Amiga launch, one theme rang out among all others: Whatever your need, the Amiga can meet it. If you're a business executive, you'll have Amiga's multitasking, speed and memory. For an additional bonus, you can also run your most important IBM PC software—the Amiga engineers have created the Amiga Emulator, an ingenious 3.5-inch PC DOS emulator disk that you can load into your Amiga's ROM, which will allow you to run the best PC software packages, like Lotus 1-2-3 and Wordstar.

If you were an artist attending the Amiga premiere, you were treated to a live demonstration of the Amiga's video interface and paint program as you watched Andy Warhol create his first computer portrait using the Amiga. He colored a

digitized image of famous singer, Debra Harry ("Blondie"). If you were a musician, you sat entranced while a programmed Amiga accompanied saxaphonist Tom Scott in live performance, following his nuances and tempo changes, in a demonstration of Cherry Lane Technologies' breakthrough program, Harmony.

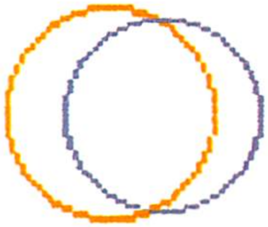
Computer programmers were pleased to hear John Shirley, President of Microsoft Corporation, speak of his company's commitment to the Amiga and the development of Microsoft's most advanced Basic to date. In addition, Dr. Martin Alpert, President of Tecmar, spoke enthusiastically about Amiga's significance to the business market.

Throughout the evening, Amiga continued to perform. Applause broke out often as graphic images appeared and danced about in dazzling color on three overhead screens. In a display of its ability to perform advanced speech synthesis, Amiga spoke to its audience and drew applause. The Amiga became a music synthesizer in its own right, emulating the sounds of a violin, xylophone and tuba. The Amiga showed off its animation features by mimicking a classical ballerina's every step in perfect synchronization with a live dancer and her musical accompaniment.



The world premiere of Amiga presents an opportunity to computer users and a challenge to the marketplace. The opportunity is to use Amiga's capabilities to gain a creative edge in all fields of endeavor. The challenge is to programmers, inventors, entrepreneurs and marketers to push computer applications to new limits and to explore uncharted ground in the microcomputer industry.

After the presentation, the enthusiastic attendees filed into the lobby and the chatter commenced. On the balcony above, Amiga software and peripheral developers had set up booths and were displaying their secretly developed products for the new Amiga. Reporters were asking hundreds of questions, freelance writers and programmers were seeking opportunities, company presidents and executives were engaged in conversation, and most everyone carried copies of the *AmigaWorld* premiere issue, a fitting accompaniment to a stellar Amiga performance.



Zeitgeist

By Guy Wright

What Is AmigaWorld *and Where Is It Going?*

It might be a little strange to admit it, but I don't think that I really know where *AmigaWorld* is going. I have a pretty good idea of what the first issue was and what this, our second issue, is and what the third issue is going to be like, but beyond that, things are pretty much up in the air. A lot depends on the Amiga computer itself and the people who buy it. If 90% of the machines are sold to the military, then I guess we will lean toward military applications. If most of the Amigas are sold to schools, then educational topics will play a major role in *AmigaWorld*. If rodeo clowns are the primary buyers of Amigas, then you can expect to see articles about horses, cowboys and fake noses.

On the surface, this might not seem like an editorial direction at all, but it is actually a calculated direction. As the name *AmigaWorld* implies, we will cover the things of interest in the world of the Amiga, and that means the world of Amiga owners. It is a curious kind of endless circle. The nature and content of *AmigaWorld* will have some influence on the kinds of people who buy the computer (in a small way, granted), and our editorial content will determine the kinds of people that we attract, so that feedback from our readers is going to be a bit self-fulfilling. (People will buy *AmigaWorld* because they like it, and they will tell us they want the kinds of things that we were already doing to attract them in the first place.)

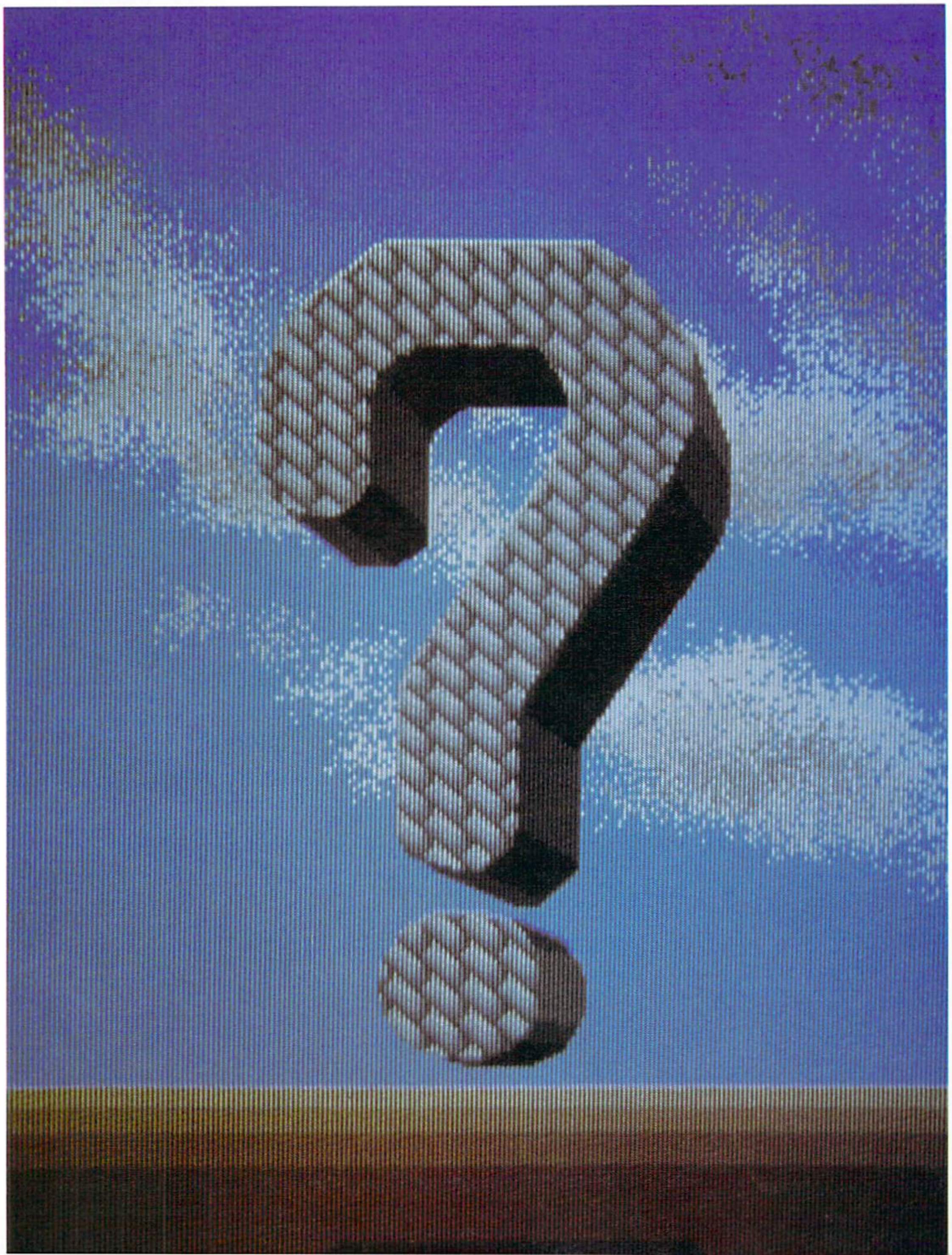
A significant time-lag problem is also inherent in publishing a magazine. We have to decide what articles we want to put in the magazine months in advance so that we can contact authors to write those articles in time for us to edit, typeset, correct, layout, print and distribute the magazines. What this means is that we start thinking about Christmas issues in July. The effect of this time lag is that by the time we can react to feedback from readers in an upcoming issue, six months will have passed.

So, as Editor-in-Chief of *AmigaWorld*, I have to be able to look into the future. I am the one who tries to decide what kinds of things YOU will want to read six months from now. If you ask anyone who has been in the industry for a while about the future of computers, they will probably say that predictions of any kind in this industry are usually unreliable. However, I can say a few things with certainty regarding what you'll be reading about in our future issues and other things that I have a pretty good feeling about.

This issue is, for the most part, dedicated to the Amiga in business environments. You will find articles about how to introduce the Amiga into the office with a few hints on things to do and not do. You will also see articles about accounting, spreadsheets and word processing. For those of you in the business of writing software, there is a piece on the programming language C and some words about some of the people in the business of writing Amiga programs.

Just so we don't alienate everyone who isn't in business, we included articles on music, digitizing video images and our other standard features, like Help Key, Digital Canvas, etc. Though this issue focuses on business (and business will be a subject that we will return to over and over again in future issues), we are not planning to make *AmigaWorld* a business/computing magazine. Or, if we do, it will be targeted toward a different sort of business—the kind of entrepreneurial business that most of our readers will want to learn about. We will have your basic articles on standard business applications on the Amiga, but we want to go far beyond that.

Illustration by Sheryl Knowles



We think that you bought an Amiga for reasons that go beyond the mundane. Your decision involved a level of excitement that other computers did not stimulate, and we want to fan that spark.

Just because you're not taking the Amiga on the space shuttle does not mean that you aren't interested in reading about someone who does. Your reasons for buying an Amiga may have been straightforward and practical, and you will probably explore it's capabilities at your leisure, but our job is to take you to the frontier and keep pushing onward. Through *AmigaWorld*, you will be able to try some of the unique, strange, complicated things that the Amiga was designed for. We will take the chances for you, and if there is something that catches your eye and fuels your imagination, you might wish to join us.

So, when you think that you have *AmigaWorld* finally figured out, think again. We may not be able to predict exactly what people will be doing with Amiga computers next August, or what kinds of articles and features we'll have then, but I am positive that *AmigaWorld* will always be unique, informative, exploratory and new. After all, don't you, the Amiga owner, deserve that?

IS COMMITTED TO THE AMIGA.

In our first two years, Electronic Arts has emerged as a leader of the home software business. We have won the most product quality awards—over 60. We have placed the most *Billboard* Top 20 titles—12. We have also been consistently profitable in an industry beset by losses and disappointments.

Why, then, is Electronic Arts banking its hard won gains on an unproven new computer like the Amiga?

The Vision of Electronic Arts.

We believe that one day soon the home computer will be as important as radio, stereo and television are today.

These electronic marvels are significant because they bring faraway places and experiences right into your home. Today, from your living room you can watch a championship basketball game, see Christopher Columbus sail to the New World, or watch a futuristic spaceship battle.

The computer promises to let you do much more. Because it is interactive you get to participate. For example, you can play in that basketball game instead of just watching. You can actually be Christopher Columbus and feel firsthand what he felt when he sighted the New World. And you can step inside the cockpit of your own spaceship.

But so far, the computer's promise has been hard to see. Software has been severely limited by the abstract, blocky shapes and rinky-dink sound reproduction of most home computers. Only a handful of pioneers have been able to appreciate the possibilities. But then, popular opinion once held that television was only useful for civil defense communications.

A Promise of Artistry.

The Amiga is advancing our medium on all fronts. For the first time, a personal computer is providing the visual and aural quality our sophisticated eyes and ears demand. Compared to the Amiga, using some other home computers is like watching black and white television with the sound turned off.

The first Amiga software products from Electronic Arts are near completion. We suspect you'll be hearing a lot about them. Some of them are games like you've never seen before, that get more out of a computer than other games ever have. Others are harder to categorize, and we like that.

For the first time, software developers have the tools they need to fulfill the promise of home computing.

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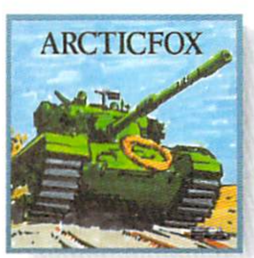
Archon

A new kind of computerized board game, like chess with wizards and dragons for pieces. But when one lands on another, they have to fight a white-knuckled action battle.



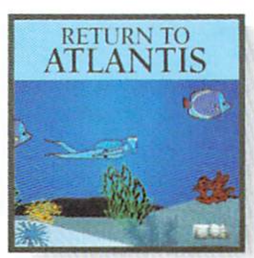
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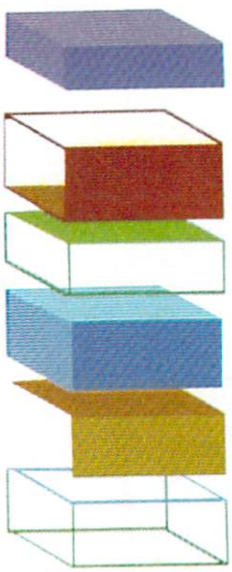
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Circle 2 on Reader Service card.

White-Collar Amiga



The Amiga is ideally suited for the office, but unless you know what you're doing, computerizing your business can be exasperating. Here are some hints for making that conversion painless and profitable.

Everyone knows that computers are valuable tools in the business environment: word processing, accounting, forecasting, spreadsheets, database managers, telecommunications, etc. Yet this is just computer jargon until it can be turned into savings in time, expenses and trouble. Bottom-line profits are the reason for having computers in business, and if you have to endure weeks of training, software that doesn't do what you need or a machine that can't handle the work load, then the flashy image or the prestigious corporate name on your computer isn't going to mean much.

The Learning Curve

Computerizing a business always involves a learning curve. That curve can be costly to any business, large or small. The curve can be as simple as learning the commands of a new piece of software or as complex as fighting a system for months before finding out that it was the wrong system in the first place. The curve can be complicated by misconceptions about just what a computer can and can't do for a business. If you are going to be keeping an inventory of 50,000 parts, as well as a payroll for 200 employees and the books for a two-million-dollar business, then a microcomputer of any make is not what you are looking for. If you think that a computer is going to help you unravel a hopelessly confused checkbook, then hire an accountant to do the company books. But if you are willing to do a little learning and don't expect the computer to change everything overnight, then there are dozens of good reasons to bring the Amiga computer into the office, wherever that office is.

The Amiga computer, the right software and the right peripherals will give most businesses a head start. It has the power, speed, peripherals and software to tackle most business problems, but the Amiga by itself is not the final answer. Using the Amiga as a base, or starting point, the person thinking about using the computer in a business should ask a few questions.

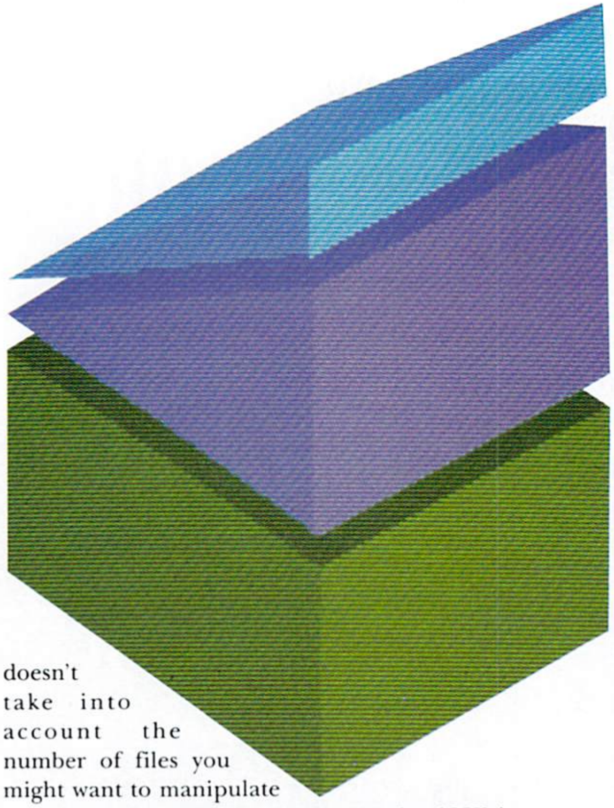
Memory Matters

What sort of memory configuration should I start with? Add to the total cost of the Amiga computer system all the memory expansion that you think you will need, rather than getting the computer with the basic 256K and then finding out later that you really need the 512K expansion, or even the 1 MB expansion card from Tecmar. Deciding how much memory you will need is not an easy question to answer, even for people who are familiar with micros in business. Keep in mind that computers are not cars, and "the more the better" principle does not always hold true.

Try to base your decision on the software that you plan to use. Most good software will allow you to expand the memory or hardware configuration (add-on drives, new printers, hard disks, etc.), but some software requires a minimum amount of memory. Read the software manuals carefully, because sometimes there is a minimum RAM required to run the program, but that ►

Photograph by Edward Judice

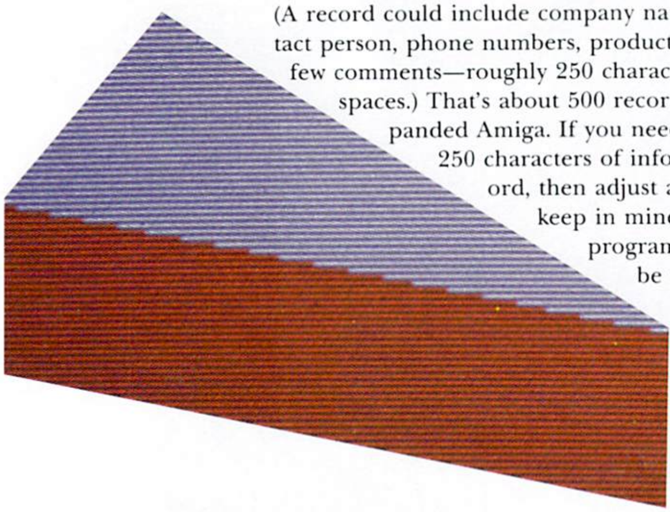

AMIGA HR
AMIGA



◄ doesn't take into account the number of files you might want to manipulate at one time. A spreadsheet may require 128K just to run, but it might only hold a dozen records at a time unless you upgrade to 512K. Consider the important difference between "minimum required" and "minimum suggested."

A good rule of thumb is "the more information you wish to work with at one time, the more memory you will need." Keep in mind that "at one time" does not mean "at one session." It is possible to segment your information into groups to be worked on separately. For example, a mailing list might not need to fit into the computer all at once. It can be saved on disk as multiple files, A–M and N–Z; then, when you need mailing labels, printing can be done in two batches. On the other hand, if you are going to need to do a cross-reference search of that list, or if you decide to enter names according to zip code rather than company name, then it might be better to have the entire list in the computer at one time.

Roughly speaking, one character equals one byte of RAM. Count on four to five records per K of memory. (A record could include company name, address, contact person, phone numbers, product description and a few comments—roughly 250 characters, counting spaces.) That's about 500 records on an unexpanded Amiga. If you need to put more than 250 characters of information into a record, then adjust accordingly, but keep in mind the size of the program that is going to be working with the information.



Modems

Another hardware aspect of incorporating an Amiga into a business is the peripherals. Will you need a modem for telecommunications? And if so, what kinds of baud rates will you need? Will you need auto-answering capabilities for when there is no one in the office to answer the phone? Do you need a Hayes-compatible modem? And most importantly, will the software you choose work with the modem you choose?

All of these questions require entire articles (or even entire issues) to be answered fully. Just remember to think about telecommunications when figuring the cost of your system and when buying software. (Someday you may want to transmit files from your word processor or spreadsheet or access your database by phone.) If you decide that telecommunications is something you definitely need, Tecmar makes a 300/1200/2400-baud modem for the Amiga that is worth looking into.

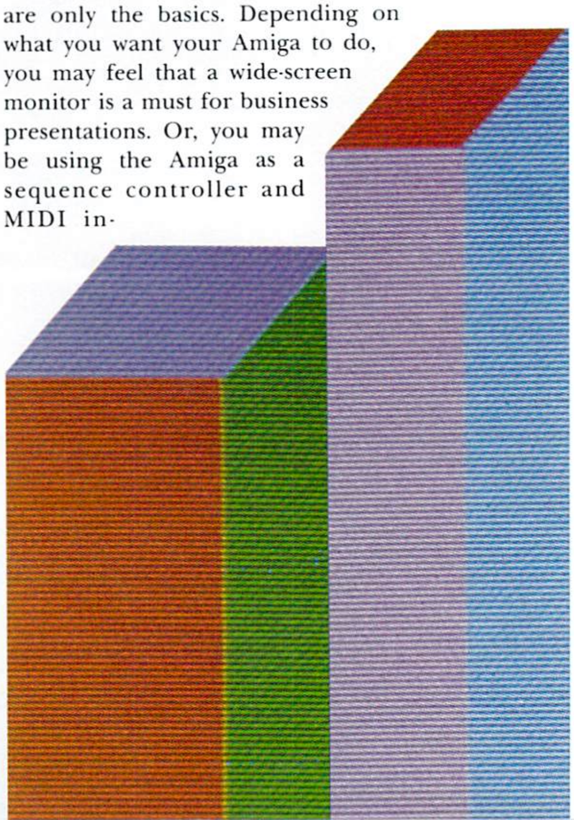
Pick Your Printer

No matter what you plan to do with your Amiga, you will eventually want a printer. There is no easy solution to the printer problem, either. First, decide how much work the printer will be doing. For occasional letters or memos, an inexpensive printer might be all that you need, but if you plan to send bulk mailings, then it would be worth your while to look into a more expensive industrial-quality printer. If you will be printing graphics, then you will need a dot matrix, thermal transfer, ink jet or laser printer. Black and white or color, near letter quality and amount of usage should all be taken into consideration when choosing one of these printers.

The Amiga can interface with most printers on the market, but not all software may work with all printers. (Just because your printer can do graphics, it doesn't mean that your graph-making program can send the right codes.) What's your top priority—speed, letter quality, price, color, versatility or durability? Again, buying a printer deserves an article all by itself.

Putting Amiga to Work

You can get dozens of other peripherals that you may feel you need for your particular business, and these are only the basics. Depending on what you want your Amiga to do, you may feel that a wide-screen monitor is a must for business presentations. Or, you may be using the Amiga as a sequence controller and MIDI in-





Blind dates and buying software have a lot in common:
It's not always easy to spot a dog!

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We have labored into the wee hours exploring our new Amigas and scouting for innovative software. We're excited!

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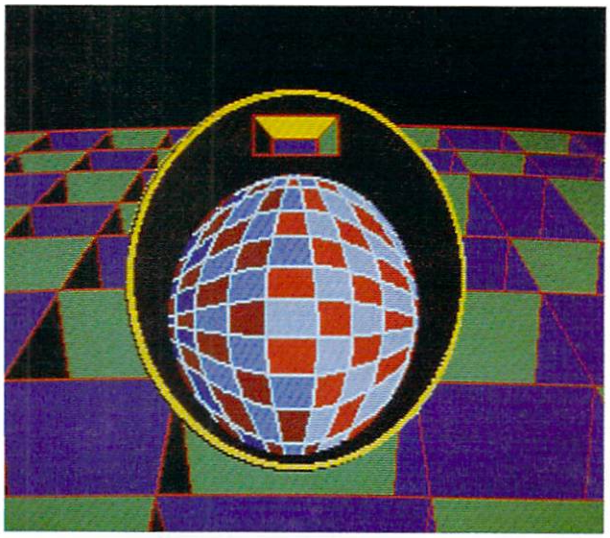
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terface. If you are designing music videos, then genlocking devices and frame grabbers may be more important to you than modems. If you are using the Amiga for security or remote measurements, then remote-sensing peripherals are what you will be shopping for. Whatever the project or task that you are asking your Amiga to perform, you should bear in mind the total cost of the peripherals when you are tallying up the total price. The computer can handle the job, but you might find that with the extra costs of add-on devices and software that it is going to take a few years to make up the initial investment.

You can always offset that investment by optimizing the use of the Amiga. You might have bought the Amiga just to print out invoices, but think about some of the other ways that the computer can help out. The Amiga is a powerful and versatile computer; locking it into one job is a waste of valuable resources. Ask yourself, what areas of the business are repetitive, calculation intensive or graphically oriented? What do you do that involves the printed page in almost any form, storing, sorting or sending information? Most of these things could be done by the Amiga with the proper hardware, software and some common sense.

Software Shopping

The second major mountain to climb when thinking about putting an Amiga to work for you is picking the right software. Choosing software is not an easy job. The package may look great and the description on the back of the box might make it sound like this software will solve all your problems, but if the people who wrote the software didn't think that it was the best thing to come along since flip-top cans, then they wouldn't be trying to sell it.

It is also easy to be impressed by a demonstration if it is done by someone who has worked with the program for weeks. Read through the manuals, get a hands-on demonstration, talk to people who own the program (or others like it), read reviews in magazines, talk to the company (if possible), and then cross your fingers and hope for the best.

Fortunately, there are a number of good software developers who are producing software for the Amiga, and with a bit of careful research, you have a fighting chance of getting what you are looking for. The Amiga's IBM emulation capability also greatly enhances the range of titles available to you initially, but these IBM software packages won't take advantage of the Amiga's special features. Be prepared to get burned at least once. That is an unfortunate fact of computing life. No matter how careful or knowledgeable you are, you *will* eventually end up buying something that will be a disappointment. If you are shopping for expensive software, take your time, but also build the price of a piece of bogus software into your total computer costs. It is not unusual to spend as much (or more) money on software as you did on the computer itself.

When you do find that "perfect" software package, remember that no software will do absolutely everything you need it to do unless you hire a programmer to develop a custom program—and even then it is going to take a while to get it right.

Easy Does It

Once you have everything you need to computerize your entire operation, you should take a half a step backward before you transfer all your records over to the computer and throw away your ledger books. Think about what would happen if the computer crashed and all your files were lost. Keep thinking about that every time you enter new information, and you'll realize the importance of making backup copies of everything! Over and over! This is not a waste of time—it is insurance. Also, you should ease into things one step at a time. Don't try to convert everything over to the computer all in the first week. Do one thing first and see how it goes for a while before gradually giving the Amiga more responsibilities.

A Little Reassurance

The Amiga isn't going to make each step a snap, but it will save you some headaches. It is expandable up to eight megabytes, which means that you should be able to do quite a bit without ever worrying about memory. (If you need more than that, then you should be looking at a minicomputer or a mainframe.) Almost all the peripherals that you can think of are available for the Amiga, and some are designed specifically for the Amiga and no other computer. It will work with almost any printer that you care to buy. The IBM PC emulator software opens up a world of business software programs that have survived the test of time.

The Amiga is easy to use, which is going to save you considerable time and effort when you are ready to start putting the computer to work for you. The Amiga is less expensive than most of the other computers in its league, and it's built for future expansion, so your investment will not be obsolete in a year or two or five. The company is strong, so you won't be left with a computer that no one is supporting. Since the Amiga is such an easy machine to develop software and hardware for, there will be lots of products to choose from in the future.

GSW

Address all author correspondence to Guy Wright, c/o AmigaWorld *editorial, 80 Pine St., Peterborough, NH 03458.*

The Right Stuff

The Amiga In the Marketplace

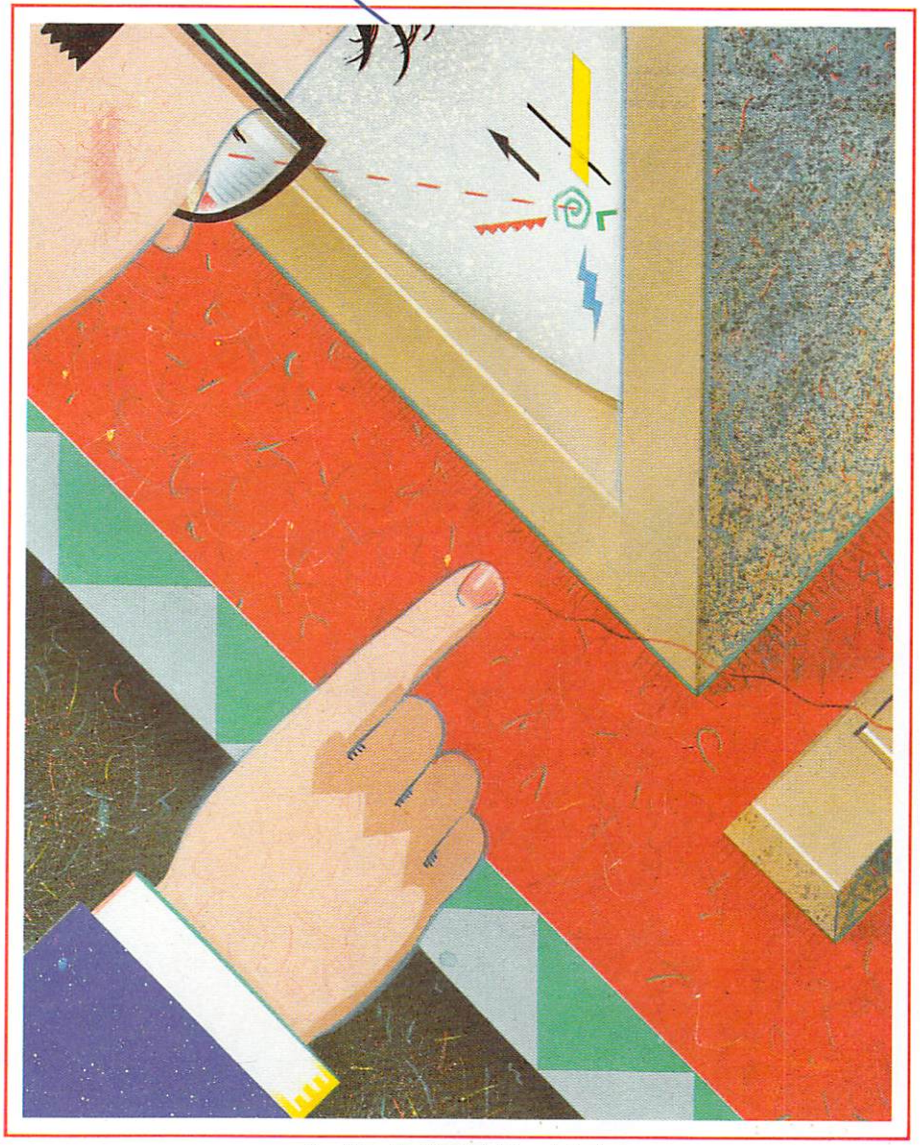
By Douglas Watt

Given the turmoil in the microcomputer market, in which even a giant like Apple is in some serious trouble and many lesser firms are simply folding, one might wonder about the wisdom behind Commodore's decision to release a 32-bit microcomputer into a section of the market that is currently in upheaval and embroiled in fierce competition. One might also legitimately wonder whether any "high-end" microcomputer, including even the Macintosh, can be a success in the business or even the home environment if it bucks the growing MS-DOS software base. Well, in this writer's opinion, a



Large Addressable Memory

Illustrations by Steven Lyons



Graphics-Supported User Interface

◀ more careful look at trends in the marketplace plus a close look at the Amiga and its competition suggests that Commodore's decision may have come at the most opportune moment possible.

Being Peerless

First things first—there is *no* competition for the Amiga in terms of its hardware capabilities in its price range, or even at twice its price. It has, simply, the best graphics this side of CAD stations, and for a fraction of the cost. Its graphics capabilities run circles around both the IBM PC and the AT, which are stuck with the same basic graphics package as the PC for maximum compatibility. The Amiga's graphics are even superior to machines such as the Tandy 2000, which cannot run much standard off-the-shelf MS-DOS software due to screen management differences between it and the IBM PC.

Forget about comparing the Amiga's sound capabilities with any of the MS-DOS machines—there is even a greater contrast here than on the question of graphics. Even the Commodore 64 with its fine SID chip has far better sound capabilities than any of the MS-DOS machines or anything made by Apple, and the Amiga's capabilities are a giant step up from the 64's.

Mac Attack

The Amiga has been called a color Macintosh, but this statement is misleading since the Amiga has many capabilities that the Mac doesn't—capabilities that were in some sense "designed out" of the Macintosh. First of all, Commodore did not make the serious design error that Apple made in failing to provide the Motorola 68000 CPU with much support. (The Amiga and Mac both use this chip.) In the Mac, the CPU is forced to handle virtually all of the screen graphics chores and I/O operations, slowing the machine down significantly (one reason why the disk drive for the machine is so slow and why Mac owners spend a lot of time watching the wristwatch icon). Such is not the case with the Amiga. With its use of co-processors, it is many times faster, plus its drive holds more than twice that of the Mac's.

Undercurrents

Although the marketplace, to the casual observer, might look saturated at this point, it would be more accurate to view it as "soft." Some signs imply that pockets of potentially intense demand are waiting to be tapped if manufacturers can convince consumers to buy now rather than wait. A brief review of some of the most significant developments over the past two years suggests that the Amiga *is* in the right place at the right time with the right capabilities. Let's look briefly at some of these trends:

► *The demand for large addressable memory.* Although CP/M is not totally dead, it clearly is not going to be a popular operating system, and virtually nothing new is being written for it. There is probably one basic overriding reason for this: CP/M could not readily run Lotus 1-2-3 due to the limitations in addressable memory of the Z-80. This, and not speed, is the big advantage that the 8088 family has over the Z-80. (Many Z-80B machines are in fact faster than the IBM PC.)

The trend towards increasingly complex integrated business software has meant that 8-bit computers (at least outside the home) are going to be left behind, since they are forced to use the cumbersome process of bank switching in order to address more than 64K. Bank switching introduces new problems, such as the issue of a standard for the addressing of the two (or more) banks. Interestingly, the 640K RAM memory limit of the 8088 family, which several years ago seemed astronomical, is now being filled by some programs and applications, and Intel and Lotus have combined to develop a new hardware/software package

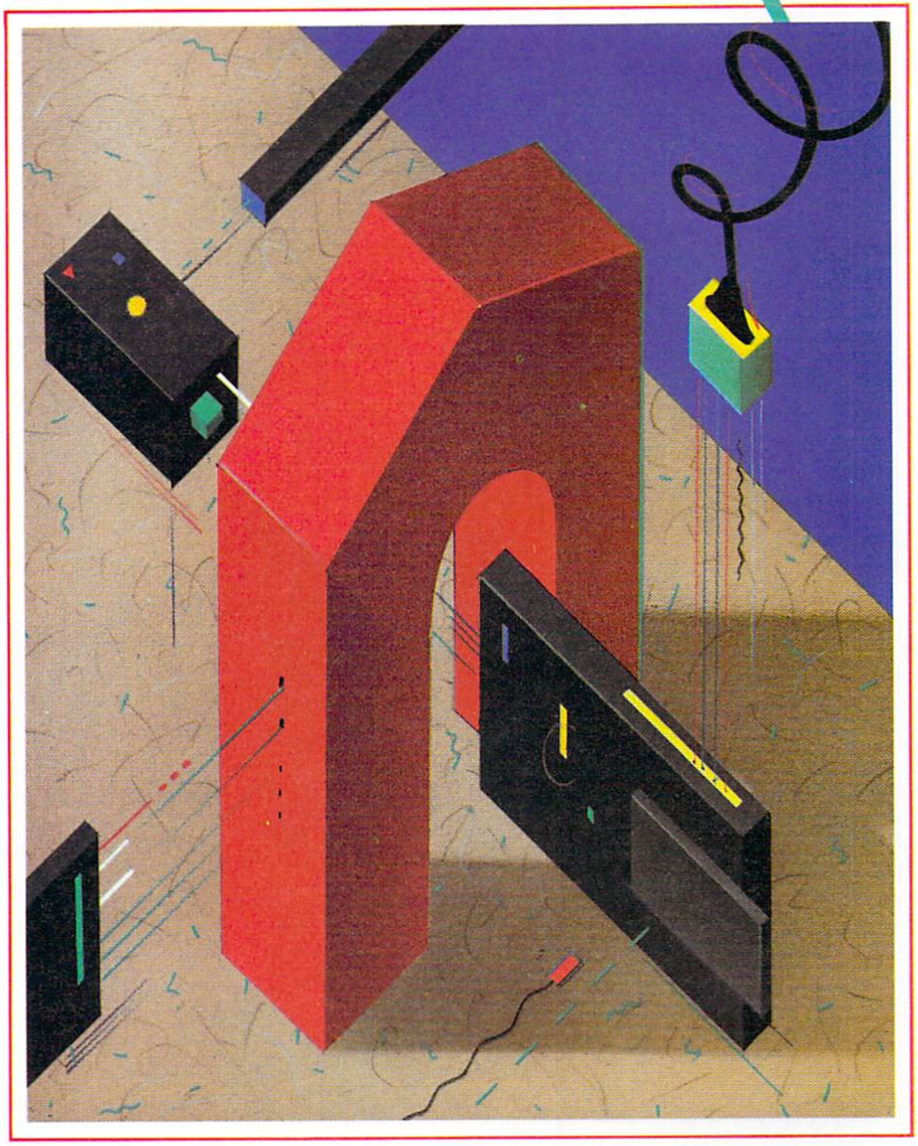
(Above Board) to extend the addressable memory of the PC family to two megabytes. The Amiga can address 8.5 megabytes without any such add-ons, so it is clearly in the right place on this issue.

► *The demand for a visually-oriented, graphics-supported user interface*. The efforts to develop programs such as IBM's Topview and Digital Research's GEM illustrate that even within the world of MS-DOS, there is dissatisfaction with the distinctly unfriendly user interface of MS-DOS, with its rather barren ">" prompt. MS-DOS (like CP/M) demands that the user master esoteric and difficult DOS commands to perform common functions such as copying files. Obviously, the impact of the Macintosh (derived from Xerox's Star system) has set the tone here. It would seem that in this area (i.e., the market's growing demand for a visually-oriented user interface supported by bit-mapped graphics), that the Amiga is, again, in the right place at the right time with the right stuff.

► *The success of open-architecture machines*. The success of the Apple II family and of the IBM PC can be traced in part to their open architecture—meaning that there is an open processor bus in the machine so that additional boards can be added—allowing for relative ease of installation for hard disk drives, co-processor boards, RAM expansion and other multifunction boards. The sales of the closed-architecture Apple IIc have not lived up to Apple's expectations, while sales of the IIe, with its open architecture, have continued to be strong and have not been hurt significantly by the sales of the IIc.

A general consensus is growing that the Macintosh has been hurt by its closed architecture. It is a strong plus for the Amiga that its open architecture will allow for special co-processors, including MS-DOS emulation and even CP/M and C-64 emulator boards, so that users can immediately access these existing software bases as well as the more sophisticated software that will take fuller advantage of the Amiga's superior capabilities. This open architecture will also allow for both the future expansion of the Amiga and the active involvement of third-party developers, guaranteeing good support for the machine.

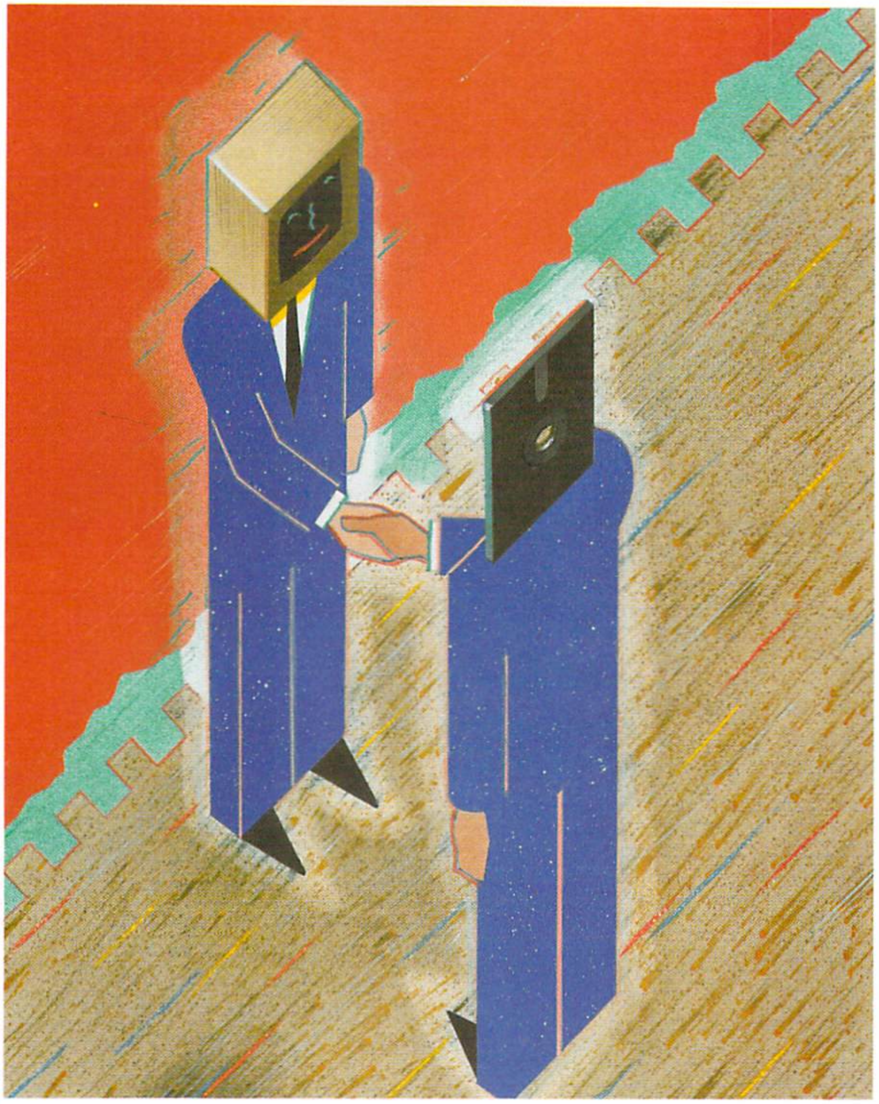
► *Hardware/software symbiosis*. There is clearly a very powerful synergistic relationship between hardware capabilities, hardware sales and software support. The huge existing base of MS-DOS software practically guarantees the continued success of the IBM PC and the PC AT, even if significantly better hardware capabilities are available elsewhere for less money (which, until the Amiga's introduction, wasn't the case). New, truly innovative hardware offering unusually great capability in a given price range (or that undercuts the competition in price) is likely to sell well enough to encourage third-party software writers to turn their attention to the machine.



Open Architecture Machines

Open architecture will allow for both the future expansion of the Amiga and the active involvement of third-party developers, guaranteeing good support for the machine.

►



Hardware/Software Symbiosis

No *competition exists for the Amiga in terms of its hardware capabilities in its price range, or even at twice its price.*

◄

This is exactly what happened with the Commodore 64/Atari 800 competition. The Atari initially had a better software base, but as Commodore consistently undercut Atari in a price war during a crucial 18-month period, first-rate software became more and more plentiful for the 64. Currently, there is better software support for the 64 than the Atari, which many companies are now reluctant to write for due to the company's (and therefore the machine's) uncertain future.

The unique hardware capabilities of the Amiga should ensure strong initial sales of the machine, and such sales produce good software support. Indications are that Commodore has learned from past mistakes in dealing with third parties, and that software developers for the Amiga are being given every consideration and meaningful support. Thus, the hardware sales/software development "snowball" should start rolling downhill and pick up speed and momentum quickly.

Futurology

The question of what will happen to personal computing through the late 80s and early 1990s is certainly open to much speculation, but there are indications that the following are going to be big factors:

1. Businesses and home users will want to routinely access mainframes and minicomputers with micros through telecommunications and local area networks (LANs). This will lead to increased use of large databases by the so-called "power users" (businesses with large data processing demands) and a growing integration-of-information power at the hands of the consumer. It will demand good terminal emulation software, as well as multitasking capabilities, both of which will be a breeze for the Amiga.

2. In the home, there will be a trend towards the integration of entertainment systems and data processing systems, particularly around their joint access to laser disks that could be used as ROM or even as mass storage devices for the computer, as well as for storing audio/video entertainment material. In this area, the Amiga's ability to mix incoming analog video signals with computer-generated digital video material will place it far ahead of the competition, and, along with its sound capabilities and sprites, will make it the greatest entertainment computer ever.

3. Low-cost, high-quality dot matrix print will be a standard. New printers using 24-pin printheads have already taken a real bite out of the daisy wheel printer market, and will make it possible to do both hi-res graphics printouts and true letter-quality (not correspondence-quality) text on the same page. This new generation of dot matrix printers will take good advantage of the Amiga's bit-mapped graphics capabilities.

Therefore . . .

After adding all this up, my advice is: If you don't get an Amiga, you might as well at least buy stock in Commodore. Point for point, the Amiga, especially once a large software base exists for it, will leave other micros in the technological dust.

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In Stark Contrast

Comparing the Amiga with the Macintosh and IBM PC

By Margaret Morabito

When a personal computer arrives on the scene, the natural tendency is to make comparisons. In the case of the Amiga, the most obvious comparisons are drawn between two well-known computers on the retail market today: the Apple Macintosh and the IBM PC.

To draw a comparison is to assume similarity. In this situation, however, you cannot assume too many similarities because the Amiga is a computer with extremely new technology. As a result, any comparison must be written and read in perspective. Both the Macintosh and the IBM PC are relatively "old" computers today, and both can "keep up" with the Amiga only through the use of expensive add-ons, which are added onto the price of an already expensive computer. With this in mind, let's proceed to a comparative overview of these three personal computers.

Microprocessors

The Amiga is built around the well-known Motorola 68000 microprocessor, which has become the preferred chip for "serious" computers. This 16/32-bit processor is a powerhouse, but the computer in which it resides must be carefully engineered to allow maximum performance.

The Amiga's design team realized that the 68000 microprocessor could become bogged down if it were assigned excessive responsibilities. A quick session with the Macintosh will reveal just how slow the 68000 can perform. Amiga's designers circumvented the problems apparent in the Macintosh by creating three custom chips that take a large portion of the workload from the 68000. The custom graphics, custom animation and I/O and audio chips were carefully designed with the intention of "freeing up" the 68000 to run at close to top speed most of the time while the Amiga runs wild with high-resolution color graphics, animation, four-channel sound and multitasking.

The Macintosh has the benefit of being powered by the 68000; however, software developers are still working very hard to try to make the Macintosh perform up to its potential. Whereas the Macintosh has to rely on smart software tricks to try to keep up with "serious" applications, the Amiga has more than enough power built into its hardware for the most demanding of applications.



The IBM PC is still hanging in there, despite the fact that it is built around an 8/16 bit microprocessor: the 8088 Intel. The slowness of the IBM PC was graphically demonstrated at one of the local Amiga launches held in late July. While emulating the IBM PC and running Lotus 1-2-3, the Amiga was noticeably slower than another Amiga which was performing multitasking while running on AmigaDOS. The Commodore spokeswoman sheepishly apologized for the long wait in loading Lotus 1-2-3, stating that in PC mode, the Amiga "totally emulates the IBM PC," including its speed, which is substantially slower than the Amiga in native mode.

Multitasking

The Amiga performs true multitasking. Its 68000 processor is available to perform various distinct applications simultaneously while the three custom chips control other tasks. Until now, this ability to do many jobs at once has not been available in an under $10,000 computer. Neither the IBM PC nor the Macintosh can perform true multitasking.

Many computer users have developed behavioral patterns based upon the limited capabilities of their personal computers. Until now, users have had to wait for their computer to finish one activity before going on to another task. The IBM PC and the Macintosh force their users to fit their own technological limitations.

With the Amiga, however, users will be able to really *use* a computer. The Amiga's multitasking capabilities will perform several distinctly different tasks. This new freedom from waiting may take a while to get used to; however, it will make one's work load flow much more quickly.

Architecture

Computers are at a point where the end user, as well as the software and hardware developers, are demanding options for upward mobility and future development. The Amiga that is for sale today is just the first in an entire new line of multitasking personal computers and has been designed with this future in mind. The microprocessor and custom chips are the most powerful to date; however, Amiga engineers realize that today's advanced technology won't be considered as such several years from now.

The Amiga is an "open" system. This has several impor-

Photograph by Edward Judice

	Amiga	*Mac*	*IBM PC*	*PC AT*
Microprocessor	68000 Motorola 16/32 bit	68000 Motorola 16/32 bit	8088 Intel 8/16 bit	80286 Intel 16/24 bit
Speed	7.8 MHz	7.8 MHz	4.77 MHz	6 MHz
Memory	256K RAM 192K ROM	128K RAM 64K ROM	64K RAM 40K ROM	256K RAM 64K ROM
Expansion (useable RAM)	Up to 512K (external—up to 8 MB)	Up to 512K	Up to 640K	Up to 3 MB
Disk Capacity	880K 3½″	400K 3½″	360K 5¼″	1.2 MB 5¼″
Video Display	RGB Composite Color TV	Monochrome	Monochrome	Monochrome
Color	Yes 4,096 colors	No (black & white only)	Separate color card[1] 16 colors on one screen	
Highest Color Resolution	640 × 400	512 × 342	640 × 350[1]	640 × 350[1]
Keyboard	89 Keys Numeric Pad	58 Keys	82 Keys Numeric Pad	84 Keys Numeric Pad
Speech Synthesis (built-in)	Yes (unlimited text to voice)	No	No	No
Music	4 channels[2] (stereo)	1 channel[3] (monaural)	1 voice	1 voice
I/O Ports (built-in)	RS 232 Parallel Serial	Serial	No	No

[1]Not included in IBM PC and PC AT basic units.

[2]The Amiga has four hardware audio DMA channels, which feed two stereo output ports. The processor is not accessed for sound generation.

[3]The Macintosh has four software-driven voices, which use over 50% of the processor's time.

A comparative look at the features of the Amiga from Commodore, Apple Macintosh, IBM PC and PC AT.

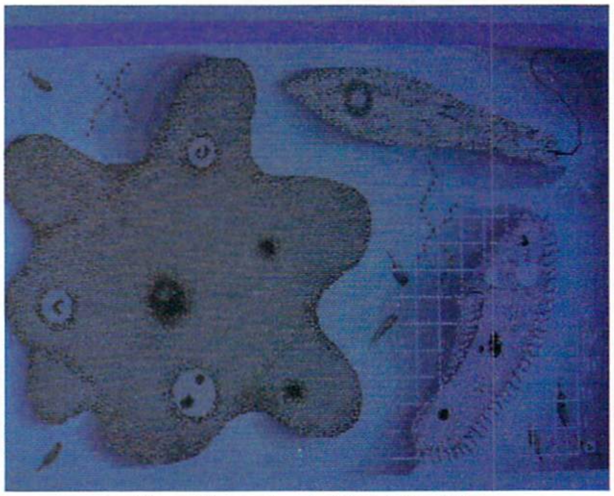
tant implications. First, third-party engineers are at work designing peripherals that will run directly off the power supplied by the 68000 bus. The Amiga's design team made the 68000 microprocessor easily available to the outside world. In fact, Commodore-Amiga enthusiastically welcomes the efforts of third-party developers who can make the Amiga even more versatile for the user.

This attitude and design philosophy is in direct opposition to Apple's design of the Macintosh. The Macintosh is a "closed" system; it was a fleeting bright spot in computer history, quickly fading because the hardware peripheral industry had their hands tied. The Macintosh's closed design made it even more difficult for software makers who tried to pump up the image of viability for the Macintosh in this rapidly advancing computer environment.

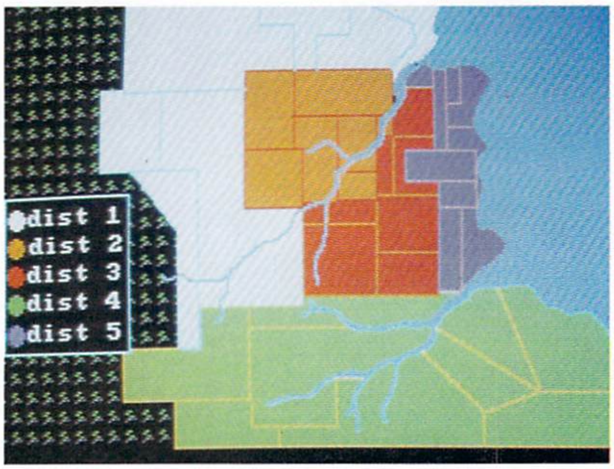
The IBM PC has been able to thrive precisely because of the fact that it was designed with the ability to accept add-on cards. Indeed, the PC won't do anything unless you buy an add-on card. IBM had a solid marketing strategy in place when it created the PC. "Make it an empty box, and sell the add-ons."

Businesses that have spent upwards of $7,000 to make their IBM PCs perform now know that they would have been better off buying a product that was complete from the start, and yet, still allowed for optional (not required) add-ons.


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Above Illustration by Island Graphics



The Amiga will be a viable computer for years to come, without relying on older technology.

Commodore-Amiga is already hard at work designing and developing the next generation of Amigas, which will hold the 68020 microprocessor and more sophisticated custom chips. How does this concern the open architecture and design philosophy of the Amiga?

This means that the $1,295 to $1,750 (with RGB analog color monitor) that you invest in the Amigas currently being sold will not go down the drain next year, or even five years from now, for that matter. New machines will be upwardly compatible with existing software and peripherals. DOS enhancements, such as multi-user features, will upgrade existing Amiga compatibility.

This is probably the most important difference between the Amiga and other personal computers on the retailers' shelves today. The Amiga will be a viable computer for years to come, without relying on older technology and without being overburdened by software that promises to do what hardware should do.

Sound

No other personal computer today has four separate sound channels and built-in speech synthesis. Certainly, there are computers that can create polyphonic sound—through software control—and that can speak—through an external speech synthesizer module and external software. However, the Amiga provides all of this within its hardware, all for the base price.

The Macintosh has one sound channel, and through some sophisticated software, it can produce several voices, but your applications can't be very demanding. The problem with multivoiced sound on the Macintosh is that over 50% of the 68000 processor's time is bogged down with handling the software-driven voices. Compare this with the Amiga's four hardware sound channels, which can perform at full capability with no time taken from the 68000.

The IBM PC can produce sound; however, it doesn't have the kind of truly flexible, pleasing music capability that the Amiga offers. The IBM PC has just a single voice, and there has been very little serious software development in this area since IBM PCs occupy business offices where the majority of users rely on monochromatic, alphanumeric, mute screens.

Graphics and Color

By now, the Amiga's reputation for spectacular color, graphics and animation is well known. Off-the-shelf, with no add-ons, the Amiga has 4,096 colors and the ability to display high-resolution graphics screens of 620 × 400 pixels. These are stock, no-frills items within the Amiga. In addition, the expected Genlock (video synch) capability is unique to the Amiga.

The Macintosh has no color, period. It has a high-resolution monochromatic screen of 512 × 342 pixels. It provides no options for adding color, or for increasing the pixel resolution. The Macintosh also has only a 9-inch monitor screen.

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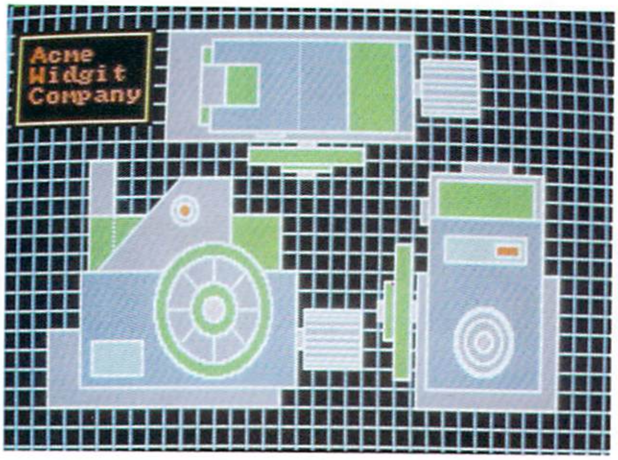
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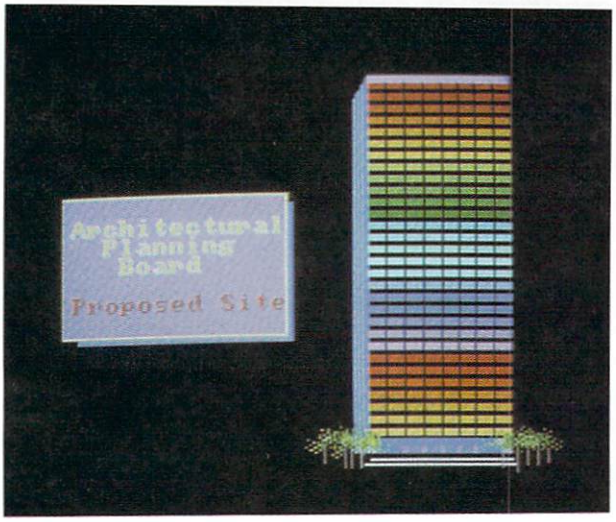
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◄ IBM had the foresight to provide for add-on cards to allow users the luxury of color displays for use with business graphics and design applications. If your budget allows for an extra $4,300 on top of the base price for an IBM PC computer station, bringing the total expenditure of the color IBM PC to over $6,000, then you can feel happy in the fact that you can attain the same 4,096 color capability as the stock $1,295 Amiga. Furthermore, that $6,000 will get you a high-resolution display of 640 × 480: pretty impressive, but at a rather absurd price for a "small business" user.

Data Storage and Memory Expansion

Even if multitasking, sound and color aren't important for your primary applications, data storage and memory are of paramount importance to all users. How many text files or Lotus 1-2-3 files can your computer store on its disk drive? How much memory can your computer address?

The Amiga's built-in 3½-inch microfloppy disk drive has twice the capacity of the Macintosh's built-in drive and more than twice that of the IBM PC's 5¼-inch floppy drive. If you need even more storage, the Amiga has a built-in port for daisy chaining up to three additional drives, for a total of 3,520K of storage.

You can build up extra disk storage on both the Macintosh and the IBM PC, but the problem is that you will be paying for not just the extra drives, but also for power boosters and adapters.

As for memory, the Amiga can address a contiguous 8.5 megabytes of memory, as opposed to the 650K of the IBM PC and just 512K of the Macintosh. This means that the Amiga doesn't have to rely on bank switching and can perform at top speed regardless of the size or the number of applications.

And More . . .

This kind of article lends itself to a catalog of comparative items, all of which reveal the Amiga to be the best personal/business computer available today. As mentioned at the onset of this article, any comparison has to be put into perspective.

What Commodore has done with the Amiga is to debunk the myth of "expensive means technologically superior." Furthermore, the Amiga gives users a crystal clear message, saying "let *your* imagination dictate the possible uses of your computer." The day has arrived when limited technology and exorbitant pricing can no longer be a justification for bland, mute computing applications.

No doubt there will be many who will ignore the Amiga and who will be satisfied with buying add-on cards for their IBM PCs, trying to make them "act" like highly sophisticated graphics machines or power workstations. Others will revel in the opportunity to put their Mac in a bag and run across campus. However, there will also be those who will realize that there is more to computing than expensive required add-on cards and cute computer bags.

Address all author correspondence to Margaret Morabito, c/o AmigaWorld *editorial, 80 Pine St., Peterborough, NH 03458.*

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Amiga's Trump Card: IBM PC Emulation

By C. Graham

Although the Amiga itself was clearly the star performer at the July 23 launch at the Lincoln Center in New York, Commodore's software emulation of an IBM PC drew its own gasps, skeptical headshaking and rounds of applause, as a Lotus 1-2-3 spreadsheet unfolded across the Amiga screen projected on center stage.

IBM's continuing consolidation of the PC and PC-DOS as defacto standards for mainstream microcomputer applications forces every new computer on the market, no matter how remarkable in terms of price and performance, to confront the issue of PC compatibility. Indeed, one of Macintosh's biggest drawbacks in business environments has been its lack of a bridge to the PC/MS-DOS world, a problem exacerbated by the Mac's closed architecture.

The Amiga, as most reviewers now agree, is a next generation micro, offering performance (speed, multitasking) and impressive features (color graphics, stereo sound and genlock capability) that will open up new markets. Despite the Amiga's advantages, however, Commodore needed to address the IBM compatibility issue for several reasons. These included the need for a mass of software available *on launch* to give the Amiga strong initial sales momentum and the desire to shake off Commodore's "home" computer image in the U.S. by assuring that Amiga owners have access to the best library of serious *business* software on the market. Commodore also wanted to ease access to the IBM-dominated corporate (as opposed to small-business) market.

To date the most common solution to the problem of incompatible operating systems has been to use dual or multiple microprocessors, either built-in or through an add-on card. It is the approach Commodore chose with the C-128, which uses both a 6502 to maintain C-64 compatibility and an additional Z80 microprocessor to run CP/M. DEC used a Z80 and an 8088 in the Rainbow.

There are many companies offering board-level products for both the IBM PC and Apple IIe that give these computers access to other DOS environments. The $1,195 MacCharlie peripheral from Dayna Communications uses an 8088 to give the 68000-based Macintosh IBM compatibility. The problem with all these dual or multiple processor approaches, especially as a board or peripheral product, is that it essentially involves building a second computer. The results are expensive, kludgey and typically unable to take advantage of the host computer's special capabilities.

A Unique Approach

Commodore's unique approach to the mutiple DOS problem—software emulation rather than hardware duplication—represents in many ways as remarkable a technological breakthrough as the Amiga itself. Software emulation of another computer operating system is very common in the mainframe world where most of the vendors offer IBM emulation, using the enormous computing power available on a mainframe to achieve the necessary performance.

Although it is theoretically possible for any computer to emulate another, the performance degradation would typically be so great that the results would be useless except as an academic exercise. The Amiga's unique hardware configurations—16/32-bit 68000, 25 DMA channels and extensive hardware support through the custom VLSI chips for I/O and graphics functions—provide the raw computing power neccessary to emulate another microcomputer successfully.

Like most of the great microcomputer breakthroughs, Commodore's IBM PC emulator emerged out of a garage operation; in this case, the two-person operation of Simile Research Inc. of New Jersey, headed by Bill Teal. Teal, who has had extensive mainframe emulation experience, approached Commodore with his software emulation solution at a time when Commodore was still planning to introduce an 8088-based card for the Amiga using its IBM PC clone technology. (Commodore has successfully introduced the PC 10 and PC 20, IBM PC and XT clones, in the European and Canadian markets.)

Despite some apprehensions about the final product's viability (after all, it had never been done before on *any* micro), the cost advantages of Simile's approach made the gamble worthwhile, and Commodore gave the contract go-ahead for what was essentially a parallel IBM compatibility/development effort. As the various proof-of-concept and performanace benchmarks were met, Commodore abandoned its internal hardware effort and concentrated entirely on supporting the Simile project. Although there were widespread rumors and reports that Commodore was working on IBM compatibility for the Amiga, the existence of the Simile software product (codenamed "Trumpcard") was known only to a handful of senior Commodore executives right up until the night of the launch—one of the better kept secrets in a notoriously leaky industry.

How Does It Work?

Commodore continues to maintain strict security over how the emulator—now called the Amiga Transformer—actually works, on the grounds that it is a proprietary product.* In general terms, however, the Transformer emulates IBM hardware, not the IBM BIOS or DOS. This means that the software the user can run, including the PC-DOS or MS-DOS operating system, are the standard and unmodified versions of such software.

Technically speaking, the Transformer interprets each 8086 instruction, calculates the effect address of the operand, and performs the operation using the Amiga's 68000. When the operand of such an instruction is a special register or memory location that controls some hardware feature of an IBM PC, the Transformer performs the equivalent action. This is how the Amiga can run software that is copy protected. The Transformer does *not* break the copy protection; it merely replies to the copy protection scheme in exactly the same way as IBM PC hardware does.

Similarly, software that writes directly to e screen memory of an IBM PC works just ıe. The Transformer knows the range of ldresses that represent IBM PC screen emory and when the effective address of ı 8086 instruction is in that range, the ransformer performs the equivalent func- on with the display system of the Amiga.

Functions of the IBM BIOS are duplicat- l by 68000 code contained in the Trans- ırmer that perform equivalent functions sing the Amiga I/O system.

The only PC functions not covered by the ransformer are those in the BASIC-A OM. The Transformer cannot run BASIC- programs or programs that depend on ASIC-A ROM routines—a handful of pro- rams out of the thousands in the IBM brary.

How to Use the Transformer

To use this IBM emulation, the Amiga wner simply inserts and boots the 3.5″ ransformer diskette and is soon faced with ıe familiar PC DOS menu screen. (The miga is now, to all intents and purposes, n IBM PC, and the user no longer has ac- ess to the Amiga's unique features, such as ıultitasking or stereo sound.) The user nen inserts an IBM application diskette, us- ng either the Amiga's internal 3.5″ drive or n optional ($325) 5.25″ drive provided by Commodore, although any standard IBM 60K drive will do.

The Transformer, which lists for $99, omes with a brief instruction booklet on ow to boot the program. Since the Trans- ormer runs PC DOS unmodified, the book- et does not tell users how to navigate their vay around the PC DOS environment itself. Commodore has wisely decided not to copy- rotect the Transformer, so that it is easily nstallable on a hard disk.

Since the Amiga drive is 880K formatted, t is possible to load the 55K Transformer rogram, PC DOS, an application (such as Ashton Tate's dBase III), and still have lenty of room for data, all on a single lrive. Most serious users, however, will buy ither an additional 3.5″ drive ($295) or an BM format 5.25″ drive, or in many cases oth. Users can swap data and uncopypro- ected programs between the 5.25″ and 3.5″ lrives at will. For those users who do not vant the bother of waiting about a minute s data files are transferred from the inter- ıal 3.5″ drive to the external 5.25″, or who lo extensive disk copying, a second 5.25″ lrive would be useful, but not necessary. Up to three external drives, in any configu- ation, can be daisy chained off the Amiga.)

As mentioned, the Transformer can run C DOS programs formatted on 3.5″ dis- ettes (e.g., software for the Data General One) or on a standard 5.25″ format. Although the 3.5″ Data General One diskettes are not widely available, IBM is widely rumored to be considering the 3.5″ format for the PC's eventual replacement. Recently, Microsoft announced the 3.5″ formatting protocol that it would support under MS DOS, and this is the protocol that the Transformer supports.

Performance

The advantages of the software emulation approach are low cost and convenience. The disadvantage is that some performance is lost, even with the Amiga. The Transformer offers comparable speed to an IBM PC for disk operations, 50% of speed for most I/O functions, and comparable or superior speed for many graphics functions. In computationally-intensive instructions, such as bit-shift operations, performance on the Transformer is noticeably slower. For applications where performance is largely constrained by the speed of keyboard input (e.g., word processing), the performance degradation is minimal. For large spreadsheets, performance is noticeably slower.

How Compatible?

Commodore has not officially stated what level of PC compatibility the Transformer will provide, beyond saying that it will run the top 25 programs on the Softsel hit list, as well as other "selected" programs. Internally, the targeted compatibility is "at the Compaq level." Since the top 25 programs probably account for 80% of all PC software sales, this will more than cover the needs of the average Amiga user. Among Commodore's list of "selected" programs are integrated packages like The Software Group's Enable; communications packages such as Microsoft's Access, as well as VT 100 terminal emulation programs and even the new Wang word processing program for the IBM PC. In its IBM emulation mode, the Amiga can also fit unobtrusively into any local area network (LAN) supporting IBM PCs. This means that out of the box, the Amiga-as-PC-clone will be able to sidestep the obstinacy in corporate America that has crippled the Mac's acceptance as a serious, networkable office computer.

Release 1.0 of the Transformer runs most IBM programs that do not require an IBM graphics card. Lotus 1-2-3, for example, does not require the graphics card for generating its charts and graphs. Release 2.0, scheduled for early November, will cover graphics-card dependent programs, including such compatibility "litmus test" programs as Microsoft's Flight Simulator. Release 2.0 will be provided for a nominal fee (around $10) to existing owners of Release 1.0 who send in their warranty cards.

More Emulators?

Theoretically, a PC emulator could be done for any micro. As noted earlier, it is the Amiga's unique hardware capabilities that make this a worthwhile effort. Now that the concept has been proven, there are bound to be other software emulation attempts on other micros. The most likely emulation products, however, will probably come from Commodore itself, for the Amiga. The two most obvious emulation candidates are Commodore's own C-64/C-128 products, and the Apple II line, both of which could be relatively easily emulated on the Amiga. If Commodore does introduce C-64 compatibility for the Amiga, it will provide an upgrade path that would allow Commodore users to keep their software base (both programs and data) as they upgrade from a C-64 through the C-128 to the Amiga. However, running most older 8-bit programs on the Amiga is likely to be of minimal utility.

Whether the Transformer's overall performance level is acceptable is largely dependent on the specific application needs of the Amiga user. For the occasional user, or for the regular PC user who does not require frequent use of large spreadsheets, the Transformer will satisfy most needs.

For those Amiga owners who need frequent access to "power" applications, Commodore will introduce a performance enhancer for the Transformer in the form of a $200 hardware accelerator. The accelerator, which will be available in November 1985, is a slim sidecar module that clips onto the 68000 expansion bus on the side of the Amiga. The module consists of static RAM chips and a custom PAL (Program Assay Logic) chip—no microprocessor. With the accelerator, Commodore believes that the Transformer will be able to achieve comparable or superior performance for most PC programs, including computationally-intensive ones.

Thus, for the price of a piece of good business software such as Symphony, Amiga owners can buy the Transformer ($99), accelerator module ($200) and an additional storage drive ($395) that turns the Amiga into an IBM PC.

*Commodore is presently releasing only Beta units of the product. We'll have a full review in an upcoming issue.—Eds.

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'The Bottom Line

ɅIn Introduction To Spreadsheets

y Vahé Guzelimian

Every night after his restaurant closes, Mr. Luciano ›es to his office, turns on his Amiga and runs a ›readsheet. He types the day's sales numbers, the ıanges in price of his ingredients, and his new ‹penses. The numbers go into a grid of cells. The col-nns of the grid represent time periods, such as onths and quarters; the rows represent revenues and ‹penses. Moments later he examines a printout that ıows how much profit he made that day, so far for ıis quarter and so far for this year. Since it is the end f the quarter, he gets a summary printout of the quar-·r's results (as shown in Figure 1).

Pasta and Profits

"Let's look into the future," he says. "If the price of ll my supplies goes up about 14 percent for the rest of ıe year, my employees' salaries go up 7 percent, and I eep prices the same, what will my profit be?" Moments ıter, the answer appears on the screen.

He wonders how much more profit he would make ach quarter if he raised the price of his most popular ish, Pasta el Pesto, by 22 percent. After a few more ntries, he gets the answer—$2,100. Confident that emand will remain unaffected by the increase in rice, he makes a note to inform the print shop to ıclude the change in the next printing of his menus.

Mr. Luciano was able to perform these tasks with his ɩmiga and a spreadsheet program that he decided was ıe best suited for his business. He had quite a choice f spreadsheet programs: Calcraft, an "entry level" preadsheet; Enable/Calc, a more advanced package; ymphony, Framework and 1-2-3—famous IBM PC pro-rams which he could run on his Amiga with the IBM 'C emulator software disk. With a little checking and ome good advice, he made his choice. *(We'll review these roducts in later issues—Eds.)*

He isn't an accountant, and he's never studied busi-ıess or finance, and he's certainly not a computer pro-;rammer. But with a little study, he mastered spreadsheeting."

His accountant used to handle every aspect of his ›usiness accounting. Whenever he wanted to find out ıow things were doing, he would call his accountant. ·everal days later, he would receive his answer, and at the end of the month, an invoice. Today, the accountant is Mr. Luciano's consultant. Once a month the accountant has a complimentary meal at the restaurant; once a year, he helps Mr. Luciano with his taxes to return the favor.

What is a Spreadsheet?

A spreadsheet is an environment very similar to the ledger sheets traditionally used by accountants and bookkeepers. It is made up of cells on a grid of rows and columns. When you start a spreadsheet program, all you have is empty cells. By determining what those cells are to contain, you create a "template" that will carry out a specific task for you. A cell can contain a label, such as the heading "Gross Profits," a number, a formula, or a reference to the contents of another cell. By making entries into the cells, you can build a model for your particular business; each factor affecting the business is entered into the spreadsheet to create a financial simulation of the business. This model can imitate the financial responses of a business so well that it can make predictions and projections of future business activity.

Flexibility and Power

One very important aspect of spreadsheets is their flexibility. They can be used for any task that requires calculations based on relationships between numbers. Adaptable to any particular or unique business, they offer limitless potential for managers and people who run small businesses.

A spreadsheet program's main strength is its ability to carry out automatic recalculations of your data. Suppose you enter the accounting for your business for 1985. If you later make changes to any of the numbers, your spreadsheet will automatically recalculate all totals and any other mathematical functions in the sheet that use those numbers. You never have to touch a calculator.

►

	1	2	3	4	5
1		Luciano's Ristorante, 1985			
2	========	========	========	========	========
3		January	February	March	Quarter
4	========	========	========	========	========
5	Food Sales	$8,765.00	$9,234.00	$9,021.00	$27,020.00
6	Bar Sales	$7,555.00	$9,443.00	$9,783.00	$26,781.00
7	Total Revenues	$16,320.00	$18,677.00	$18,804.00	$53,801.00
8					
9	Supplies	$2,251.00	$3,588.00	$3,432.00	$9,271.00
10	Bar	$1,621.00	$1,893.00	$2,040.00	$5,554.00
11	Salaries	$3,244.00	$3,500.00	$3,750.00	$10,494.00
12	Rent/Utilities	$980.00	$980.00	$980.00	$2,940.00
13	Insurance	$130.00	$130.00	$130.00	$390.00
14	Misc. Expenses	$453.00	$398.00	$489.00	$1,340.00
15					
16	Total Costs	$8,679.00	$10,489.00	$10,821.00	$29,989.00
17	========	========	========	========	========
18	Net Profit	7,641	8,188	$7,983	$23,812
19	========	========	========	========	========
20					
21					

Figure 1. A sample spreadsheet from Luciano's Ristorante.

	1	2	3	4	5
1		Luciano's Ristorante, 1985			
2	==========	==========	==========	==========	==========
3		January	February	March	Quarter
4	==========	==========	==========	==========	==========
5	Food Sales	8765	9234	9021	=SUM(RC[-3]:RC[-1])
6	Bar Sales	7555	9443	9783	=SUM(RC[-3]:RC[-1])
7	Total Revenues	=SUM(R[-2]C:R[-1]C)	=SUM(R[-2]C:R[-1]C)	=SUM(R[-2]C:R[-1]C)	=SUM(RC[-3]:RC[-1])
8					
9	Supplies	2251	3588	3432	=SUM(RC[-3]:RC[-1])
10	Bar	1621	1893	2040	=SUM(RC[-3]:RC[-1])
11	Salaries	3244	3500	3750	=SUM(RC[-3]:RC[-1])
12	Rent/Utilities	980	980	980	=SUM(RC[-3]:RC[-1])
13	Insurance	130	130	130	=SUM(RC[-3]:RC[-1])
14	Misc. Expenses	453	398	489	=SUM(RC[-3]:RC[-1])
15					
16	Total Costs	=SUM(R[-7]C:R[-2]C)	=SUM(R[-7]C:R[-2]C)	=SUM(R[-7]C:R[-2]C)	=SUM(RC[-3]:RC[-1])
17	==========	==========	==========	==========	==========
18	Net Profit	=R[-11]C-R[-2]C	=R[-11]C-R[-2]C	=R[-11]C-R[-2]C	=R[-11]C-R[-2]C
19	==========	==========	==========	==========	==========
20					
21					

Figure 2. The same spreadsheet with formulas included.

Once you enter a model of your business into the spreadsheet, you can do "what if" tests. By estimating an increase in your gross sales for 1985, you can see instantly what your profits and tax liabilities will be and make projections.

Possibilities

Spreadsheets are only empty cells until you enter labels, values and formulas to tap their potential power. Because of their flexibility, they can be used as tools for performing a wide variety of tasks. Here are some common uses for spreadsheets in the office and the home.

Business Applications

- general ledger
- accounts receivable/accounts payable
- inventory management
- auto expense or telephone logs
- advertising expense analyses
- loan amortizations
- job costing
- product planning
- new business budgeting
- balance sheets
- income statements

Home Applications

- home budgeting
- managing bank accounts
- completing State and Federal tax forms
- managing home inventory for insurance purposes
- tracking such investments as stocks, options, bonds and mutual funds
- managing collectibles such as stamps, coins and books
- completing statements of net worth

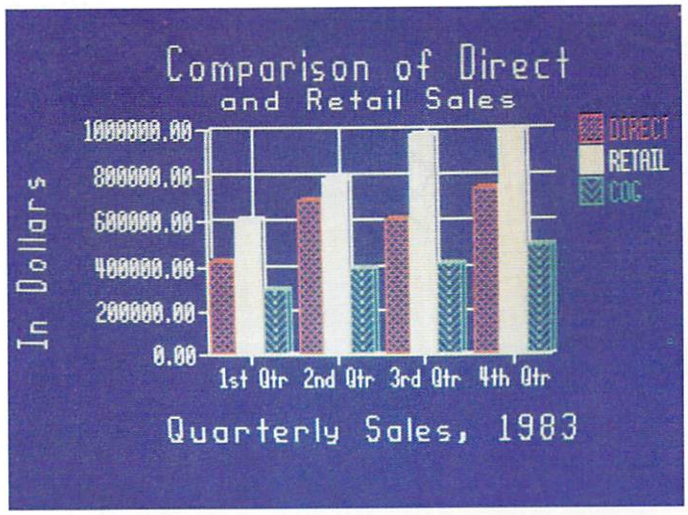
Features

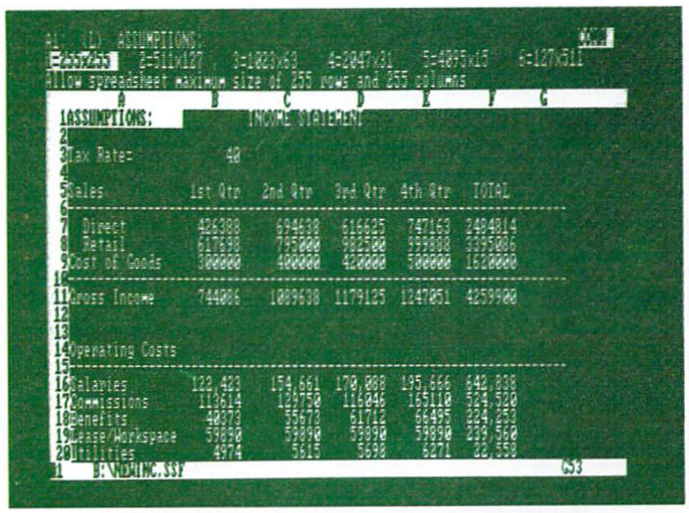
Spreadsheets aren't just cells that can hold numbers and make calculations. The evolution of spreadsheets from their first appearance in 1978 has resulted in the development of a multitude of features that make them very powerful and easy to use.

Automatic Formulas. Most of the better spreadsheet programs offer a menu of formulas commonly used in business and finance. Instead of typing in each formula from memory, you can simply choose the one you want and the formula appears in the cell of your choice. Most programs offer the following types of formulas:

- Mathematical formulas, from sum and absolute value to rounding and logarithmic formulas.
- Trigonometric formulas such as sine and tangent.
- Logical formulas such as if, false and true.
- Financial formulas, such as the present value of a series of payments or effect of periodic interest rate.
- Statistical formulas such as mean, standard deviation and standard error.
- Special functions that allow you to look up numbers stored in tables in separate parts of the spreadsheet.

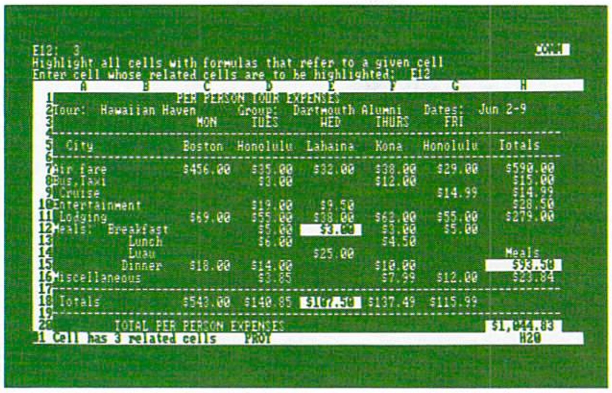
Of course, you're not limited to available formulas. You can build any formula you want. Some spreadsheets even let you add your custom formula to the menu, so you never have to type it in again.

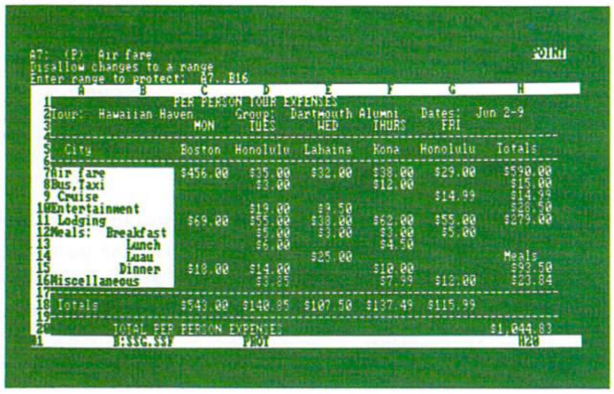




Absolute or Relative Cell References. Spreadsheets can refer to a cell in two ways. By naming the row and column number of a cell, you make an *absolute* reference to it. Or, you can refer to a cell by its position *relative* to the currently selected cell. For example, if you want to refer to a cell that is 21 rows up and two columns to the left of the selected cell, you can refer to it in a code such as R[−21]C[−2]. Formulas made up of relative cell references can be copied from place to place in the spreadsheet while maintaining the validity of the formula. In the sample spreadsheet in Figure 2, all the totals for the quarter were calculated with the same relative formula: SUM(RC[−3]RC[−1]). As soon as the first one is calculated, all you have to do is copy the formula in all the other cells to get the correct formulas for the other sums.

Many programs give you the freedom of not having to type in the cell reference by its column and row number. When you want to enter a reference to a cell into a given cell, you can just point to the cell you want to refer to and click the mouse button. The cell's relative reference is then entered into the selected cell. You can even mark a range of numbers—for adding a column of numbers, for example—by dragging the mouse cursor across the range. The relative range reference is automatically entered into your formula.





Linking Spreadsheets. Some spreadsheet programs offer a great deal of power by allowing the user to make links between several spreadsheets. For example, a number generated in one spreadsheet can be entered automatically into a cell in a second spreadsheet. If a cell value changes in the original spreadsheet, the cells that depend on this cell's value in the second spreadsheet are automatically updated.

"Macros." Once you become proficient at using spreadsheet programs, you'll find that there will be times when you will want to carry out an operation that involves entering a long string of commands. Some spreadsheet programs allow you to make the press of one or two keys represent a long string of commands. These "macros" can save you a great deal of time.

To satisfy your business needs, integrated spreadsheet packages offer components that work in harmony, such as a spreadsheet, graphics, word processing, database management and telecommunications.

Working with Other Programs. Spreadsheet data can be transported to other applications such as charting or word processing programs. A chart program, for example, allows you to create colorful business graphics from the generated data. With a camera, you can create effective slides of pie charts and scatter diagrams for your next slide presentation.

You can also use spreadsheet programs to collect current stock market quotations over the phone. These programs link with the spreadsheet you've designed and automatically dial the number of the quotation service, get the information you require and analyze it with your spreadsheet. If the spreadsheet model is well designed, you may be able to spot trends and act quickly to make a profit. This can help you become independent of brokers for making investment decisions, saving you money on brokerage commissions and giving you greater control of your investments.

Integration. Some spreadsheets go even further by providing the word processor and charting capabilities within the spreadsheet itself. In this way, you can use your model to get calculations, and then, at the click of the mouse button, view your data in chart form, without having to exit the program to start a separate charting program.

The larger integrated packages offer up to five components that can work in harmony to satisfy most of your business needs. The components are usually a spreadsheet, graphics program, word processor, database manager and telecommunications package. An application of their combined use might be:

► The spreadsheet is used to analyze financial data.
► The graphics component charts the data from the spreadsheet.
► The database program tracks lists and creates reports that may include data from the spreadsheet.
► The word processor prepares letters containing ranges of numbers from the spreadsheet and a chart that represents this data from the graphics component.
► The telecommunications component zaps the letter to an associate.

Protection. Once created, a model has cells in which numbers must be entered. All other cells that make up the model are labels or formulas and should not be altered. Most spreadsheet programs offer a protection feature to let you protect the cells containing labels and formulas so they can't be accidentally changed. A password is required to reverse the protection. A protected document usually doesn't display cell division marks or row and column numbers. When a number is entered into a data entry cell, pressing the Enter key will take the cursor to the next data entry cell, prompting the user to enter another value or to press Enter to go on to the next unprotected cell.

Ready-Mades

You don't have to spend hours developing models for the dozens of practical applications you may find for your spreadsheet program. There are a number of books available with sample spreadsheet models for home and business use. By entering these models, you'll learn a lot more about how spreadsheets work. If you don't have the time or desire to enter your own models, you can purchase ready-to-use models on disk from many software manufacturers. These models can then be customized for your specific needs.

Before he bought his Amiga, Mr. Luciano thought a spreadsheet was something you put on a bed. Now he speaks of his business as having two stages—before and after spreadsheets.

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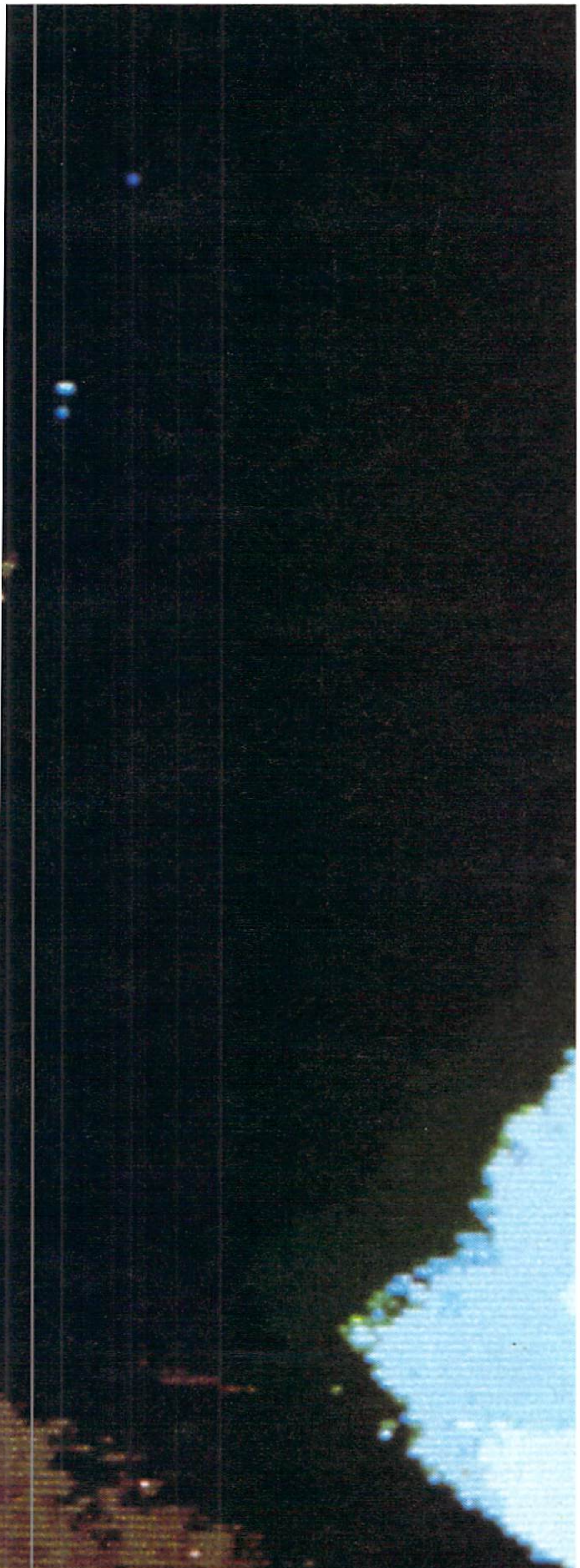
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Circle 12 on Reader Service card.



Illustrations by A-Squared Systems



Digital Imagery

By Matthew Leeds

Digital image processing is a rapidly growing field with virtually unlimited applications. The Amiga and a digitizer will bring this new technology within the reach of businesses, art studios, schools and even homes.

You see digitized images all around you today. Most of the time, you don't even recognize them as such. Many of the photographs in newspapers are delivered by news agencies over a telephone line using a digitizing scanner, and then reconstituted on the receiving end. If you've purchased a television in the last year, you might have a digital set. These technologically advanced entertainment centers offer digital stereo sound, the ability to zoom an image on the screen and split-screen options, allowing you to watch two programs at the same time. Digital image recognition is used in manufacturing, process control, astronomy, medical X-ray analysis and cartography.

Until a few years ago, digital image processing was very expensive. Equipment started at $30,000. In fact, there were no systems available for personal computers until manufacturers were able to utilize new technologies to allow medium-resolution systems at moderate prices. Low-end systems now start at $250, and good high-end systems are below $10,000.

These falling prices can be attributed partly to the increased use of graphics in business. Executives are using more computer-generated and/or computer-enhanced images in their presentations, and they are looking for cost-effective means of producing them. Many are still going to professional computer graphics suppliers, but larger companies have started bringing their production in-house. This has several benefits: faster turn around times, more control over the finished image, security of sensitive data and better cost controls. ►



◄ The use of digitizing equipment allows end users to input artwork from a variety of sources, and then modify or enhance it. Images in digital form can be manipulated in ways that traditional image-creation techniques are unable to duplicate, thereby saving hours of repetitive and costly labor.

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Digitally-created images are being seen more and more. Several recent science fiction movies have used digitally-created imagery: *Dune, 2010, Blade Runner* and *The Last Starfighter.* Television commercials are also using digital images to sell products. The premier example of this was the commercial for the Canned Food Information Council that ran during the 1985 Super Bowl. It featured a computer-generated female robot moving and speaking with human-like smoothness. Other examples include the opening to a PBS special on Vietnam and most automobile ads.

The Technology of Video

However, there is a difference between images created by a computer and those created with a video camera. The process of converting images created with a video camera or other video source to something a computer can utilize is called digitizing. To understand why we need to convert from a video source, we first need to understand the underlying technology of video.

All video used in the United States conforms to a set of standards called RS-170 NTSC. There are other standards used elsewhere in the world (e.g., PAL and SECAM), but we will confine our discussion to NTSC.

Just about all computers today use a video display called a cathode ray tube, or CRT. Most CRTs use a technology called raster scan to produce an image. All CRTs contain at least one electron gun, used to "paint" the image on the inside of the glass face of the CRT. Monochrome displays use only one gun, and color displays use three. The electron beam is directed by the display controller in the computer.

Imagine yourself holding a can of spray paint, and standing in front of a blank wall. Starting in the upper-left corner, you begin to paint a straight line towards the right. To make the paint thicker and the image brighter, you press harder on the nozzle. When you get to the edge of the wall, stop pressing the nozzle and move your arm back to the left side of the wall. Start painting just below the line where you started. Keep painting until you have painted $262\frac{1}{2}$ lines. This is one field of the display. Now go back to the top. There's a gap between each line. Fill in each gap, one at a time. This is the second field of the display, and it completes one frame. Don't forget you have to complete each field in $\frac{1}{60}$ of a second. Also, your paint fades in less than $\frac{1}{2}$ a second, so don't stop painting. This is how a monochrome monitor works. For color, get two friends with different colors to help you paint. Try not to tangle your arms.

That is the essence of raster-scan technology. The paint spray is the electron beam, the wall is the inside of the CRT and you are the display controller. The NTSC standard uses $262\frac{1}{2}$ lines in each field. By interlacing two fields, it is possible to create a resolution of 525 lines on the screen. For higher resolution, we require a different technology.

The NTSC signal combines the information for the three colors in a single signal. By separating these into three, and sending them individually, we can increase the resolution significantly. This separated information is called RGB, after the red, green and blue signals that are its components.

All of this information is sent to the CRT in analog form (i.e., as a voltage level that varies depending on the brightness of the image and in sync with the horizontal and vertical scanning pulses). These pulses are sent each time the raster finishes a horizontal or vertical scan, and they tell the electron gun to turn off until it returns to the left edge of the screen and moves down one scan line (for horizontal) or to the top of the screen (for vertical). The screen is composed of phosphors that glow when struck by the electron beam. Each point of light is called a pixel, or picture element. The intensity of the beam controls the brightness of each pixel.

The display controller converts the bit-mapped display of your computer into an analog signal that your TV or monitor can display. However, it cannot convert an analog signal back into a bit map. This is why you need a digitizer (also known as a "frame grabber").

Another name for a digitizer is an analog-to-digital converter, because it converts the analog video signal to a digital signal. The analog signal is a wave with highs and lows. The converter looks at, or samples, the analog signal, and if it is at a high, it sees that as an "on" bit. If it is at a low, it sees that as an "off" bit. Sampling only for high or low will result in only a black-and-white image. For more colors or a gray scale, you need to sample the same pixel several times with a graduated threshold. Each graduated level corresponds to a color or gray scale in the final image. The threshold level should be adjustable through either hardware or soft-

ware. This sampling goes on at a very fast rate. To sample enough information for a screen with a resolution of 640 × 400 pixels in black and white would require 256,000 samples in $^1/_{60}$ of a second. To store this image would require 32K of RAM. If you wanted to capture a 16-color image, you would need 128K RAM. The bit samples are usually stored in a matrix, with each screen line of the image in one row of the matrix and the sampled bits in the columns.

There are several tradeoffs evident here. To get higher resolution requires a higher sampling rate. This requires more RAM in which to store the information and a system that can display that resolution. The same tradeoff occurs as you add more colors to the image. At a resolution of 640 × 400 pixels, black and white needs 32K RAM, four color needs 64K RAM, and 16 color needs 128K RAM. That's for one image. Imagine trying to digitize and store a one-hour film on disk at 24 frames per second. Think of it. A 16-color movie would require 128K × 24 frames × 60 seconds × 60 minutes. That's over 11 gigabytes of memory!

There are other considerations. Not only does the digital converter need to calculate a brightness level for each pixel, it also must assign a coordinate for each pixel. This information is then passed to the computer. There are limits to how fast the information can be transferred. If the digital converter does not have its own RAM in which to store the memory map, it is usually not possible to convert a video image in one scan. By using successive scans, and sampling different sections of the image in each scan, it is possible to transfer information at a rate the computer can handle. This could result in a smeared image due to changes from scan to scan. Some slow scan systems may take as long as a minute to digitize an image.

For many applications, you may want to use the computer as a source of graphics to combine with video. Although it is possible to digitize a frame, add your graphics to the image and then record it back to tape, this has many limitations. It will only work with still images, the resolution may be lowered, and it will be difficult to combine graphics with preexisting videotape. The simple answer to this problem is to overlay the computer-generated image on to the video image in real-time. This requires hardware that has gen-locking capability.

Video signals require complex timing and synchronizing. Horizontal drive, vertical drive, burst flag, subcarrier, color frame ID pulse and blanking are some of the signals. Every video source has its own generator for these signals, and to combine two video sources, the timing must be "locked" together. If the two sources are not "in sync," you could have one source trying to start a raster scan at the top of the screen while the other is already halfway down. With two signals trying for control of the electron beam, the display controller would develop schizophrenia. This locking is usually accomplished by using a sync or gen-lock generator. You must also have a gen-lock input on your video equipment.

With the proper software and a gen-locked digitizer, you can perform dissolves, wipes, overlays, blackouts, fades and a variety of other special effects. Using several video decks, it would be possible to create a computer-controlled video-editing system.

Digitizing Systems

Over the last 18 months, several manufacturers have released digitizing hardware for a variety of machines. All of these systems include some software, and a few offer high-level applications packages. The most interesting discovery I made after looking at all these systems was that prices are falling dramatically at the same time that capability is expanding.

There are several systems available for the Commodore 64. The Digi-Cam from Cardco is a combined black-and-white video camera and digitizer. Software is included to enhance or print the image and transmit it over a modem. Computereyes from Digital Vision is a hardware/software package with three scanning modes. (There is also a version of Computereyes for the Apple II family.) The MicronEye from Micron Technology uses an OpticRAM camera and an interface board. Software is included to save and display black-and-white or gray-scale images and print them with Epson/Gemini printers.



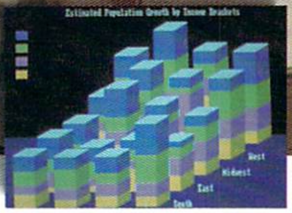
Koala Technologies has a product for the Macintosh called Macvision. This is a hardware/software system that attaches to any video source and creates a gray-scale image in five seconds. The ThunderScan from Thunderware is an unusual device that attaches to the Macintosh printer. It replaces the ribbon and uses the printer to slowly advance a document or artwork through the platen as it scans the image.

For many applications, you may want to use the computer as a source of graphics to combine with video.

The most sophisticated applications for microcomputers are currently running on IBM PCs. Imaging Technology offers a full line of image-processing hardware and software. Their PC Vision Frame Grabber offers 256-level gray-scale, or 16 million pseudocolors. It also has full gen-locking capability to a variety of video sources. Chorus Data Systems also has a professional-level system for image digitizing, called the PC-Eye ►

YOU'VE ALWAYS HAD
NOW YOU CAN HAVE AN

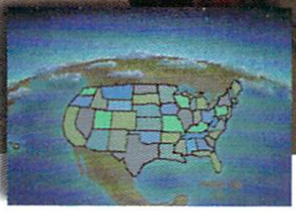




Amiga's 4,096 colors give your business graphics a visible advantage.



Amiga's 4 channels of stereo give you a sound advantage.



Learning on Amiga is higher education.

A LOT OF COMPETITION.
UNFAIR ADVANTAGE.



Nobody ever said it was going to be easy. But it just got easier. Now, there's Amiga.™ The first and only computer to give you a creative edge.

Amiga makes you look better, sound better, work faster and more productively. It can be your number cruncher, filing system, audio-visual department, graphic designer, print shop and faithful workhorse.

You can't buy a personal computer at any price that has all of Amiga's features. Nor can you find one that's easier to use. Amiga lets you point at symbols instead of learning complicated commands.

Amiga is friendly, but it's a powerhouse, too. It has twice the memory of Macintosh™ or IBM® PC. It costs less than either of them and can do everything they can do, better, because Amiga is more creative.

No other personal computer gives you over 4,000 colors, stereo sound and incredible dimension. Imagine the advantage of preparing business presentations with color graphics and sophisticated animation right on your computer.

Need to make creative use of your time? Amiga can do as many as four or five things at once in separate windows on the screen. Not just display them. Work on them. No other personal computer can.

Amiga will print the cover memo while you're working on a spreadsheet. And there's probably enough power left over to receive a phone message or a stock quote over a modem at the same time.

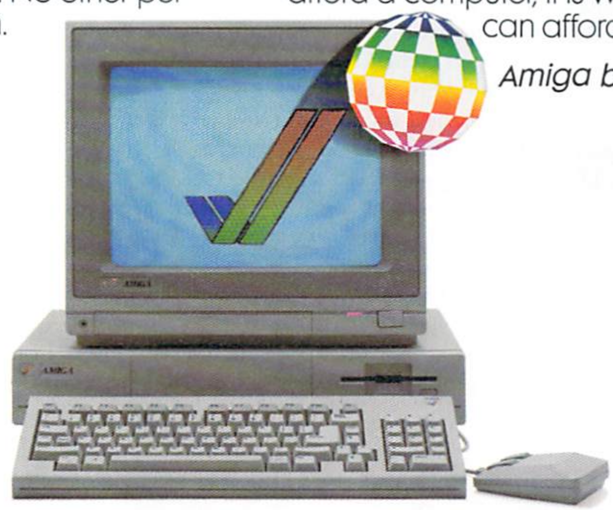
Amiga is IBM-compatible, too. A simple piece of software teaches Amiga to emulate the IBM operating system, so you can run most IBM programs. You'll have instant access to the largest library of business software in the world, including favorites like Lotus® 1,2,3 and dBase.®

And since Amiga is the last computer you'll want to buy, it was only fair to make it endlessly expandable and adaptable. You can plug in printers (almost any kind), joysticks, your video recorder, video camera, modems, musical keyboards, drawing pads, extra disk drives. You can even expand the memory to a whopping 8 megabytes.

Amiga will talk to you, read back what you write, answer your phone and compose music like a professional synthesizer. It can add new creativity to your life and bring new life to everything you create.

See an Authorized Amiga Dealer near you. Now that Amiga is here, the question isn't whether you can afford a computer, it is whether you can afford to wait.

Amiga by Commodore





Amiga makes telecommunications fast, easy and colorful.

AMIGA GIVES YOU A CREATIVE EDGE.

Video Capture Board. It has resolution up to 640 × 512 in black and white, and it is supported by several applications packages.

For those systems that do not have gen-locking capability, there are several manufacturers offering stand-alone devices for overlaying computer-generated graphics and video. Valiant I.M.C. markets the Telecomp 1000. This mixes any two NTSC video sources and outputs a single signal in NTSC video, or RF-modulated for display on a television set.

An Amiga Digitizer

A digitizer for the Amiga has been developed by an Oakland, California company called A-Squared. (Andy Warhol used this digitizer to "paint" Deborah Harry's portrait at the Amiga's debut at Lincoln Center.) It plugs into the expansion bus and has an optional external power supply. You could plug in more than one digitizer and do dissolves, wipes and other effects from one source to the other. Input from any composite video source—camera, computer, laser-disk player or VCR is acceptable. There is also an RGB input.

The addition of visual images can make the difference between just another report and a complete presentation.

The digitizer is capable of storing an image with eight levels of gray, in 320 × 200 resolution. There are plans to allow for the capture of a 32-color image, and there's also talk of software to allow for 640 × 400 in 16 colors. A-Squared plans to release a series of programmer's tools to ease the creation of applications software. These will include drivers for the hardware, overlay and false-color routines, moving windows, graphics overlays and full file structure information. There will also be routines for capturing a set of images over time.

The design of the Amiga digitizer is unique. It contains no on-board RAM, and yet it can digitize in real-time. This is in part due to the speed of the Amiga's microprocessor, which runs at exactly twice the frequency of standard video signals. Since the bit map is stored in RAM in the Amiga, it is possible to capture more than one image at a time. In fact, you are limited only by the amount of RAM and the size of the image you are grabbing. It is possible to store about one second of real-time images and view them in sequence. It is also possible to capture images using a time-lapse technique.

The Amiga digitizer works by sampling a video field every $^1/_{60}$ of a second. It then converts the analog signal to a bit map, called a bit plane. It takes three fields to give enough information for an eight-level gray-scale. Each pixel is controlled by three bits, one from each bit plane. This would require $^1/_{20}$ of a second to complete the three scans necessary for an image, but the software retains the existing bit planes and updates each one as the scan is completed, on screen and in real-time. If a bit changes, the gray scale for that pixel changes.

The software included with the digitizer stores information in a file format that is compatible with the Graphicraft paint program from Amiga. This format could become a standard, with all other software developers creating applications using it. It takes 24K to store one digitized screen, so you can fit over 30 on a single disk.

The Amiga digitizer is due out in Oct. '85; the price, though not yet official, will be around $200–$250. Thanks to its open architecture, A-Squared was able to use the Amiga's unique hardware capabilities and produce a product with professional features unheard-of in its price range.

Unlimited Applications

A-Squared is looking at several applications for the Amiga digitizer. One area of interest is the creation of color separations for silk screen, T-shirt and other medium-resolution printers. The systems now in use cost over $20,000.

Thermal studies using an infrared camera are useful diagnostic tools in sports medicine. Injured joints show up hotter than the surrounding tissue. An Amiga, digitizer and thermal camera would bring the cost down to a level that a small clinic could afford.

Other uses for digital image processing are limited only by your imagination and your pocketbook. The addition of visual images to a business report can make the difference between just another report and a complete presentation. Visual databases can be used for inventory-control purposes, allowing an operator to visually match a stock item without knowing its part number. Parts suppliers could offer electronic catalogs of their products, on disk with an integrated ordering application. Updates could be easily added without the cost of reprinting a paper catalog. In fact, they could be sent over the telephone lines via modem.

Real-estate listings could be available on-line and include pictures of the properties. Lot size, floor space, age and condition of each building could be listed, as well as information on current loan costs and comparables. Financial calculations on monthly payments, property taxes, insurance and closing costs could be added to a printout of the property for prospective buyers to study at their leisure.

Security and law enforcement personnel could maintain an image database of faces along with personnel records. Signatures could be added to the file and compared using software. It's hard enough to forge a signature, let alone a face.

Medical records could include X-rays, sonigrams, cell slides or other visual information. In the long run, it might be possible to create a standard for the storing and retrieving of medical data. This would allow for a universal medical Eprom card containing all of an individual's lifetime medical records.

There are other medical applications. Using a variety of image-manipulation functions known as *radiometric operations,* it is possible to enhance the usefulness of an image. Contrast stretching is used when all of the pixel brightness values in an image fall into a small range. By taking the lightest values and redefining them as white and the darkest values as black, and linearly varying the midvalues, it is possible to increase the useable information in an image.

Another function is *density slicing.* By selecting pixel values that fall within a specific range, it is possible to

select certain details within an image and highlight them. This process is often aided by the use of *pseudo-color processing*, which involves assigning colors to ranges of pixel values. You've seen this in pictures taken from the LANDSAT satellites.

Some additional techniques include *spatial operations*. Spatial texture, registration procedures, filtering and feature extraction are some of the operations that are used in image processing of CAT scan results, structural X rays, thermal analysis, nondestructive testing, astronomy and geophysics.

There are a tremendous number of other applications: interior design, computer-aided design and manufacture, robot vision, video post production, sports training, graphic arts, computer simulation, motion study, electronic art, animation and hundreds of educational possibilities.

Home uses also come to mind. More and more families are using video cameras instead of Super 8. A digitizer would allow for the creation of either a disk-based picture album or hardcopy still images. With the coming of CD-ROM-based encyclopedias, a digitizer could be used to include diagrams and pictures in school reports and homework assignments. Children could color in digitized images of their favorite Saturday morning cartoon characters. MTV fans could create their own posters of rock stars.

Bright Future

The future of digital image processing is bright. Improvements in image resolution will continue at an accelerated pace as the cost of memory falls. Sophisticated data-compression software may decrease the needed RAM to store an image and allow digitally stored images to approach the resolution of taped images at a cost that businesses can afford.

Linked to a laser printer, image processors will combine many of the functions of the office photocopier, fax machine and graphics workstation. Connected to a video projector, they will replace the 35mm slide projector in business presentations. The addition of optical character recognition capability will create a system that can interactively learn new fonts, read a printed page and convert it to an ASCII file.

As more people purchase digitizers, more software applications will be created by third-party developers. Education, graphic arts, manufacturing and business will all benefit from the use of digital image technology.

As a graphics workstation, the Amiga should be at the forefront of low-cost commercial and consumer applications of image processing. The potential of the Amiga with A-Squared's digitizer in the graphics/video markets should give the Amiga a tremendous boost.

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Earth will be destroyed in 12 minutes to make way for a hyperspace bypass.

Should you hitchhike into the next galaxy? Or stay and drink beer?



Simply slip the disk in your computer and suddenly you are Arthur Dent, the dubious hero of THE HITCHHIKER'S GUIDE TO THE GALAXY™ a side-splitting masterwork of interactive fiction by novelist Douglas Adams and Infocom's Steve Meretzky. And every decision you make will shape the story's outcome. Suppose for instance you decide to linger in the pub. You simply type, in plain English:

>DRINK THE BEER

And the story responds:

YOU GET DRUNK AND HAVE A TERRIFIC TIME FOR TWELVE MINUTES, ARE THE LIFE AND SOUL OF THE PUB, TELL SOME REALLY TERRIFIC STORIES, MAKE EVERYONE LAUGH A LOT, AND THEY ALL CLAP YOU ON THE BACK AND TELL YOU WHAT A GREAT CHAP YOU ARE AND THEN THE EARTH GETS UNEXPECTEDLY DEMOLISHED. YOU WAKE UP WITH A HANGOVER THAT LASTS FOR ALL ETERNITY. YOU HAVE DIED.

Suppose, on the other hand, you decide to:

>EXIT THE VILLAGE PUB THEN GO NORTH

In that case you'll be off on the most mind-bogglingly hilarious adventure any earthling ever had.



The Hitchhiker's Guide to the Galaxy comes complete with Peril Sensitive Sunglasses, a Microscopic Space Fleet, a DON'T PANIC Button, a package of Multipurpose Fluff and orders for the destruction of your home and planet.

You communicate – and the story responds – in full sentences. Which means that at every turn, you have literally thousands of alternatives. So if you decide it might be wise, for instance, to wrap a towel around your head, you just say so:



>WRAP THE TOWEL AROUND MY HEAD

And the story responds:

THE RAVENOUS BUGBLATTER BEAST OF TRAAL IS COMPLETELY BEWILDERED. IT IS SO DIM IT THINKS IF YOU CAN'T SEE IT, IT CAN'T SEE YOU.

But be careful about what you say. Or one moment you might be strapped down, forced to endure a reading of the third worst poetry in the galaxy; the next you could be hurtling through space with Marvin the Paranoid Android aboard a stolen spaceship.

And simply staying alive from one zany situation to the next will require every proton of puzzle solving prowess your mere mortal mind can muster. Even simple tasks can put you at wit's end:

>OPEN THE DOOR

And the story responds:

THE DOOR EXPLAINS, IN A HAUGHTY TONE, THAT THE ROOM IS OCCUPIED BY A SUPER-INTELLIGENT ROBOT AND THAT LESSER BEINGS (BY WHICH IT MEANS YOU) ARE NOT TO BE ADMITTED. "SHOW ME SOME TINY EXAMPLE OF YOUR INTELLIGENCE," IT SAYS, "AND MAYBE, JUST MAYBE I MIGHT RECONSIDER."



Other interactive science fiction stories from Infocom include PLANETFALL,™ in which you're stranded on a mysterious deserted world. STARCROSS,™ a puzzling challenge issued eons ago and light-years away. SUSPENDED,™ the race to stabilize an entire planet's life support systems. And A MIND FOREVER VOYAGING,™ a radically new work of serious science fiction in which you explore the future of mankind.

But don't panic. You'll be accompanied every light-year of the way by your trusty Hitchhiker's Guide, which you can always depend on for up-to-the-nanosecond information. Well, almost always:

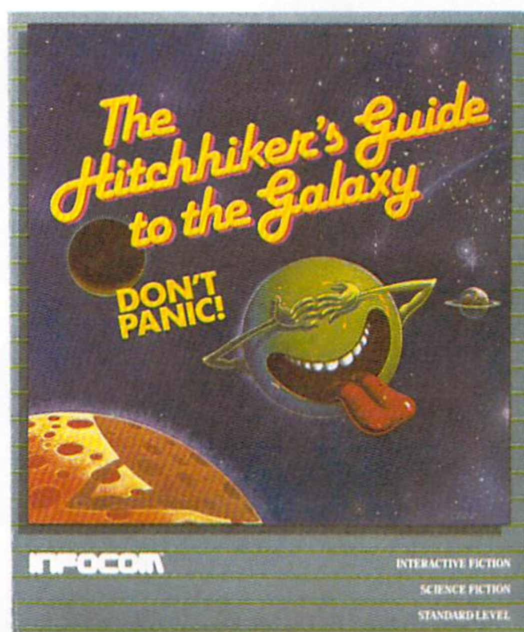
>CONSULT THE HITCHHIKER'S GUIDE ABOUT THE MOLECULAR HYPERWAVE PINCER

And the story responds:

SORRY, THAT PORTION OF OUR SUB-ETHA DATABASE WAS ACCIDENTALLY DELETED LAST NIGHT DURING A WILD OFFICE PARTY.

So put down that beer, take that towel off your head, open the door, hitchhike down to your local software store today and pick up THE HITCHHIKER'S GUIDE TO THE GALAXY. Before they put that bypass in.

Still not convinced? Try our Sampler Disk which includes portions of four different types of stories for a paltry $7.95. If it doesn't get you hooked on the addictive pleasures of Infocom, return it for a full refund. If it does, you can apply the price toward any Infocom story. You can't lose!



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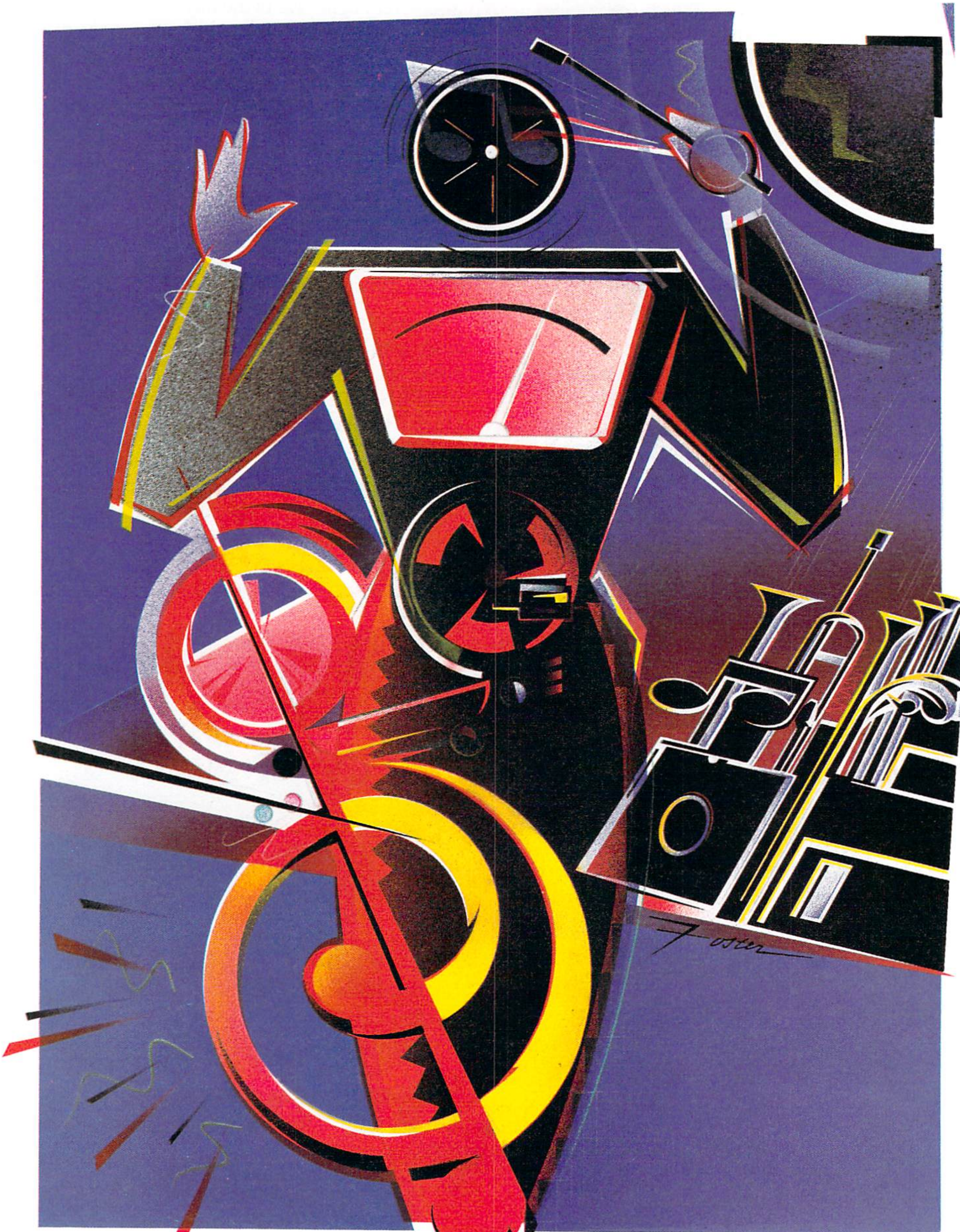


Illustration by Matthew Foster

Music by MIDI: The Marriage of Talent and Technology

MIDI is now the standard of communication between computers, musicians and their instruments. For a euphonious price, your MIDI-equipped Amiga can place you in the avant-garde of the revolution in music. **By Peggy Herrington**

Predictions about the dramatic changes technology is bringing to our lives have made us expect a great deal from personal computers. But unless you like programming or write lots of letters, you may be languishing for lack of stimulating, yet practical, applications for your computer. Just recently, a splendid irony has been emerging through the infusion of high tech's austere logic into one of the oldest and most subjective, emotional and creative disciplines known to mankind—music. This was evident at the Amiga's launch in New York, where Tom Scott, Michael Bodicker and Roger Powell, using the MIDI interface, drew great applause in a live performance.

The trend now is to put together a professional/home music studio, which functions due to an idea called MIDI (Musical Instrument Digital Interface). The basis of this studio is a personal computer with a disk drive and your home stereo system. If you already have these, the addition of a music synthesizer or two with a MIDI interface and some software will cost much less than a new piano or organ. The potential uses of the two music systems differ so enormously as to render them incomparable.

A small MIDI studio can provide hours and hours of enjoyment for you and your family and work to great advantage in many hobby and semi-professional situations: providing accompaniment for choirs and bands, for instance, or producing music and sound effects tracks synchronized with the actions of home video recordings or local theatrical productions. Specialized MIDI software for music education is in its infancy, but it already offers lessons without scornful glances or rapped knuckles, scheduled entirely at your convenience with as much repetition as you (or your kids) find necessary. MIDI-equipped music laboratories in schools and colleges may revolutionize the way music has been taught since Mozart was a kid.

Leader of the Band

MIDI is simply a set of standards or rules governing—and actually making possible—communications between different brands of electronic musical instruments through the management and memory of a personal computer. The Amiga, with its 256K of memory, multilayered operating system, sophisticated graphics and digital sampling capabilities, is extremely well-suited for MIDI applications. (In order to grasp the far-reaching effects MIDI has had on the music industry as a whole and get some ideas on what you could do with a home music studio, see How the Pros Use MIDI, p. 56.)

The music synthesizer is widely acclaimed as the 20th century's primary contribution to music, and it is the standard fare of many instrument manufacturers these days. Although they vary widely in features and price, synthesizers are virtually all MIDI-equipped. Developed in the 1920s, synthesizers usually house one Voltage Controlled Oscillator (VCO) per voice, and, just like traditional instruments, produce sound by vibration. Pitch is controlled by the amount of voltage applied, usually one volt per octave. Through selectable waveforms, multipart sound envelopes, filters and other sophisticated innards, each brand has its own distinctive sound, along with the ability to imitate traditional instruments.

Sounds Like Numbers

Another electronic instrument that looks and plays much like a keyboard synthesizer is a digital sampling keyboard—but the similarity is only skin deep. A digital sampler is more versatile and powerful than a synthesizer because it isn't limited to producing sound with

►

How MIDI Works

The Musical Instrument Digital Interface "standard" was developed by a group of music-industry savants about four years ago. It was the first concerted effort to establish a much needed industry-wide protocol for communications between electronic musical instruments, recording and effects devices and computers; it provided the first direct link between these two industries. The fact that virtually all electronic music equipment is now MIDI-equipped is indicative of its resounding success.

Musical Connections

Along with its individual components and circuitry, each MIDI-equipped instrument houses a receiver for reception and execution of instructions through use of an optoisolator and a Universal Asynchronous Receiver-Transmitter (UART), plus a transmitter that can originate MIDI messages, sending them by way of the UART and a line driver. Connections are made to 5-pin female DIN receptacles, usually located on the back panel of the instrument (only pins 2, 3 and 4 of which are used and labelled MIDI In and MIDI Out). These are often accompanied by an optional MIDI Thru, which forwards incoming MIDI data to the next instrument within a "daisy-chained" MIDI system.

Shielded cables of twisted pair wiring with 5-pin male DIN connectors at each end are used to connect synthesizers to each other, to other electronic devices and to an optional personal computer with a hardware interface.

In its most elementary formation, two brands of synthesizers can be connected so that they both sound when the first is played, either in unison or at predetermined intervals, by installing a cable from the first synthesizer's MIDI Out to the second synthesizer's MIDI In. With another cable running from the second synthesizer's MIDI Out to the first's MIDI In, both synthesizers sound when played from either keyboard.

Cable arrangements between three synthesizers determine if all three will sound when played from one keyboard (done by using MIDI Thru from the middle one) or if only two will be activated, which two depending on the arrangement of the cables and which keyboard is being played.

A Song to Remember

Music parameters from MIDI instruments, such as pitch, note duration, settings for instrument sounds (called "programs" in the music biz) and channel specifications can be saved in computer memory, altered (with appropriate software) and transferred to disk. If a drum machine is in use, it acts as the master time keeper, just like the drummer in a real band. If not, the computer synchronizes all timing systems.

MIDI software instructions are written in low-level assembly language and consist of specific sequences of characters that make up the MIDI instruction set. Word length is eight bits, with one start and one stop bit (for a total of ten); transmission is done serially at a rate of 31,250 bits per second, which is certainly fast enough when you consider that music is a "real-time" process with no need to ever re-send a note, for example. Data can be transmitted over 16 channels simultaneously, and each instrument (sometimes even each voice) can be assigned its own channel. But the manner in which an instrument will respond to incoming channel information is determined by selecting (on that instrument's control panel, if not available through software control) one of four MIDI modes of operation. These modes are the result of combinations of three MIDI messages: Omni (On means to accept instructions from all channels, Off from only one) and Poly and Mono (which, depending on the Omni setting, determine how many notes are assigned to each channel).

► *Mode 1.* Omni On, Poly (also called Omni mode): When set in this mode, an instrument will respond to instructions sent over all 16 channels, regardless of the channel to which it is set. This is the usual setting on power-up.

► *Mode 2.* Omni On, Mono: This mode assigns all incoming information from all channels to one voice and will play monophonically (one note at a time), even if MIDI instructions are to play a chord.

► *Mode 3.* Omni Off, Poly (also called the Poly mode): Set in this mode, an instrument will respond only to information from its assigned channel; it is useful for playing specific parts on different instruments.

► *Mode 4.* Omni Off, Mono (also known as Mono mode): In this setting, each voice on a multitimbral instrument can be set to its own channel. It is used for getting one synthesizer to play different instrument parts multitimbrally.

MIDI supports many more subtle functions required for successful control of synthesizers and the like, but it's important to realize that it is not a cure-all: It won't make an instant musician out of just anyone. Neither will it transfer hardware-based features from one instrument to another. If a synthesizer isn't multitimbral in the first place, "MIDI-ing" it to one that is won't make any difference.

For more information, a booklet called *Korg Guide to Understanding MIDI* is available from Unicord/Korg, and the MIDI 1.0 Specification itself can be obtained from the International MIDI Association, a non-profit users' group, located at 11857 Hartsook St., North Hollywood, CA 91607, 818-505-8964.

the back-and-forth vibrations of VCOs. You can think of it as a deluxe recording device that translates sounds into numbers which can then be manipulated in ways other than those of VCOs.

Until recently, a digital sampling keyboard was much more expensive than a synthesizer. Now, however, the MIDI-equipped Ensoniq *Mirage* ($1,695, developed by some of the engineers responsible for the video and music chips in the Commodore 64) offers eight voices with a five-octave (61 key) velocity-sensitive keyboard and built-in 3½" disk drive. It is capable of digitizing sound from just about any source, including your voice and those sounds distinctive to popular models of synthesizers. In short, the Mirage can not only imitate traditional instruments in a far superior manner, it can also mimic synthesizers. It must be heard to be appreciated. Because of these qualities and its price, the Mirage is one of the most prominent bridges yet to be constructed between professional and home MIDI applications.

Several other pieces of MIDI hardware herald its homecoming and are distinguishable from professional equipment by ease of use and lower prices. *Max*, a six-voice MIDI-equipped synthesizer, comes with 80 built-in instrument sounds. Casio's *CZ-101* synthesizer ($499) has four MIDI-programmable voices (plus four more that are not MIDI) and a four-octave keyboard (however, its keys are roughly half the standard size). The CZ-101 stores 32 different instrument sounds. Both of these synthesizers are multi-timbral, which means that they are capable of sounding different instruments and musical lines simultaneously through MIDI up to the limit of their voices: Max with six, and CZ-101 with four. What's special about these synthesizers is that they are designed with the MIDI home music studio in mind, although they are finding homes with the professional crowd, too.

Plugging In

A MIDI hardware interface, which attaches to a personal computer, is connected by standard cables (MIDI In, Out and Thru) to a synthesizer, which in turn can be chained to another synthesizer, and another, etc. Interfaces for the Amiga are available from Cherry Lane Technologies ($59 to $79). Interfaces are pretty well standardized now, with the exception of a line of Intelligent Interfaces from Roland, which take over some of the processing from the computer. Nevertheless, because this is a new industry, finding a particular MIDI software application for your brand of computer can be exasperating. MIDI software determines what you can do with your system, and it falls generally into four categories: music performance, score printing, music education and home entertainment or recreation.

Sound Software

The Music Shop ($49.95) from Passport Designs is the first software on the market designed specifically for MIDI recreational music composition. A modification of a program designed originally for the Commodore 64's SID chip, it features icons with pull-down menus, dialog boxes and screen displays of pages of standard music notation, which can be printed with a dot-matrix printer. With this, you can record multipart music with synthesizers like Max, the CZ-101 and/or the Mirage digital sampler, store your compositions in computer memory (and later on disk), edit, manipulate and rearrange your music, and finally, listen to it or play along using it as prerecorded accompaniment.

> *Sophisticated MIDI software is needed to foster the growth of electronic music in colleges and high schools. When it is available, it will revolutionize the teaching of music.*

Computer Sheet Music from Passport Designs/Hal Leonard Publishing can be used with any MIDI keyboard. It is a software series featuring music from popular recording artists (Michael Jackson, for one). Keyboard technique is taught with songs displayed on the screen in standard notation with chords; notes change color as they are played correctly on the keyboard.

A more extensive line of interactive music education software, from Electronic Courseware Systems, is being distributed by Passport: *Keyboard Blues* teaches blues chords, 12-bar blues and the composition of original blues solos, without making judgement on quality. *Keyboard Chords* covers qualities of simple major, minor and augmented chords in both treble and bass clef and includes spelling drills and tests. *Keyboard Intervals* teaches the student to play and recognize major, minor, augmented and diminished intervals. *Keyboard Jazz Harmonies* includes tutorials and quizzes on chord symbols, chord recognition and chord spelling. *Keyboard Kapers* has three timed piano keyboard games for developing basic sight-reading skills. *Keyboard Note Drill* is a more advanced sight-reading program covering treble and

bass clefs, and *Super Challenger* is a keyboard-oriented ear-training tutorial covering major and minor intervals on the 12-note chromatic scale.

Learning the Tune

More sophisticated educational MIDI software will be needed to foster the growth of electronic music laboratories in colleges and high schools. When it is available, it will revolutionize the teaching of music in the classroom. Since most MIDI keyboards accommodate ear phones, centralized music systems with peripheral computers and keyboards could allow an instructor to monitor the progress of a group of students as each works at his or her own pace on music theory, ear training, composition, orchestration, scoring and, of course, performance. Software could make learning notation much easier by automatically translating keypresses into standard music symbols, or displaying what the student played as opposed to what should have been played. It could help develop timing skills or play a counterpoint melody or harmonic accompaniment along with the student. But wait—that's

How the Pros Use MIDI

The very nature of musical performance has been improved by the implementation of MIDI. Not only can a musician sound more notes on stage than he or she has fingers (through use of pre-recorded accompaniments loaded from disk), but any MIDI-equipped synthesizer can be set up as a "master" unit, with key presses on it traveling as signals through MIDI cables to be played on "slave" synthesizers capable of making sounds not available on the master. That means a performer can play more than one synthesizer from a particular keyboard—no small accomplishment, because different brands of synthesizers (like computers) do things differently. For example, one brand may produce a type of sound another doesn't, or may produce a particular sound better than another (woodwind, for instance), which is why performers commonly use several synthesizers on stage.

Live Performance

Polyphonic synthesizers can simultaneously sound different timbres, or instrument sounds (also called programs, presets or patches), but in live play, most make only one type of sound at a time. In other words, while a synthesizer may have six voices, be programmable and therefore capable of producing a nearly unlimited variety of sounds, all of its voices make the same type of instrument sound when played live from the keyboard. (An exception to this is the synthesizer that allows you to split its keyboard, declaring part of it as one instrument, part as another.)

Without MIDI, on-board sequencers are used to record separate instrument lines from a single synthesizer (one at a time), which, when played back together, result in the multitimbral sound of a group of instruments. How much multitimbral music can be recorded this way is determined by the amount of information that the synthesizer's internal sequencer can hold, and sometimes that's not much. While it's tough for one person to play more than two synthesizers live (one for each hand), with MIDI many different electronic instruments (synthesizers, guitars, drum machines, special effects devices, etc.) can operate in concert, each multitimbrally (provided it has that capability in the first place), all under the control of a single musician.

Playing the Circuit

Today's professionals who use synthesizers concern themselves less than they used to with technique or the physical/stylistic management of an instrument (called "chops" by popular music pros). Indeed, some wonder if the term "virtuoso" has much meaning in this field. MIDI-equipped synthesizers have given these new performers great freedom to establish rapport with an audience and accomplish what they're up there to do: entertain. Talent, skill and study are, of course, still requirements, but they're often applied in different areas; although synthesizers are associated with the familiar piano keyboard, playing one is worlds away from playing a piano.

Of course, synthesizer musicians need not learn acoustic instruments intimately, but a different touch is required to mimic them successfully on a keyboard: Horns, stringed and percussion instruments sound very different from each other, and each needs to play in its native range. Arrangement and instrumentation become highly valued skills, as are a knowledge of computers and electronics. Programming a drum machine (a specialized music synthesizer) isn't as easy as whistling Dixie.

The MIDI Edge

MIDI, however, offers many advantages not enjoyed by traditional musicians. With a component MIDI system (which means equipment can be upgraded or new pieces added), instrument parts can be played individually, either with a metronome keeping time or with previously recorded parts, and stored automatically in computer memory and later saved to disk. This recording of parts can be done at a comfortable pace and the entire piece boosted to tempo with no effect on pitch. Instrumentation—the selection of instruments for various parts—can be repeatedly adjusted between synthesizers. Through MIDI software control, music can be displayed on the screen or on paper with a printer and edited, manipulated and rearranged as extensively as the program allows.

Playing live (with or without a prerecorded accompaniment) is enhanced by a synthesizer, because it can produce many "fat," interesting sounds. A performer can create full, aurally rewarding music using only a

actly what our next program does.

Scroll Over Beethoven

A line of MIDI software for the Amiga from Cherry ne Technologies (some of which have educational d recreational features) promises to establish this mputer at the forefront of MIDI applications, both ofessionally and in the home. *Harmony*, released concurrently with the Amiga, is an accompaniment program developed jointly by Cherry Lane and Carnegie-Mellon University, incorporating artificial intelligence and speech-recognition concepts. As you play on a MIDI keyboard, it supplies the accompaniment and follows *your* lead. *Texture* features an extensive music sequencer; it is graphics-oriented, but it does not feature standard notation. It utilizes the Amiga's ability to overprint graphics on videotape. *PitchWriter* works with Harmony and digitizes pitch from monophonic sources, sending them through MIDI to be played by a synthesizer; this might be a good way to practice playing your horn, for instance.

Cherry Lane is also developing an Amiga music notation package and a synthesizer package, the latter using digital sampling techniques to create sounds for MIDI-based synthesizers. With the exception of Texture ($199), these programs will retail from $99 to $149 each and are planned for release in approximately two-month intervals after the introduction of the Amiga. *(For more details, see our article on Cherry Lane Technologies, p. 58.—Eds.)*

Last Note

Watching the home entertainment industry emerge is an experience that might move you to visit a music retailer for a demonstration of a keyboard or two. And after that, who knows? With a small MIDI music studio, you and your Amiga can start making some incredible music.

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ew notes. Blocked chords, one-handed melodies or ven one finger are sometimes all that's needed.

Euphonious Effects

The equipment that's available for professional performance is a musician's delight. If you've already eveloped your chops on a guitar, as opposed to a keyoard, the Roland GR-700 Guitar will sound not only ts own internal circuitry, but also that of MIDI keyboard synthesizers, sequencers, drum machines and so n. Or maybe you want to get an acoustic, electric or lectronic piano into the act; MIDI Retrofit Kits from 'orte Music will send notes, velocity or pitch from a electable area of the piano keyboard (it reads the sustain pedal, too) through MIDI to a synthesizer, leaving he rest of the piano keyboard playable as usual. If you lon't want to haul a piano around, maybe Cherry Lane nakes what you're after: *PitchWriter* extracts the pitch from a monophonic source (which can be a voice) and sends it via MIDI to a synthesizer to play. Want to synchronize stage lights with music? With J. L. Cooper's MIDI Lighting Controller 1, you can prerecord lighting and special effects in synchrony with the music.

Professional Repercussions

MIDI systems are employed widely in professional recording studios. Because MIDI synchronizes internal iming differences between synthesizers and ancillary equipment, thereby providing compatibility, only MIDI units with inherent special qualities (e.g., a synthesizer which produces a unique sound) need be carted to and from the studio by a performer cutting a record. In fact, sometimes a good deal of the performance can be recorded by the artist at home and delivered to the studio on disk or multitrack tape. Progressive radio and elevision stations and production companies have a marketing advantage, because in-house MIDI music studios are affordable and very well-suited for making sound tracks for commercials. The versatility of synthesizers under MIDI control is so great that a single knowledgeable composer can record complete motion picture sound tracks, which used to require an entire orchestra.

In the music industry, and all other industries in which sound production and recording play a part, MIDI is changing what we hear and the role of those who create it.

List of Companies

Casio Inc.
15 Gardner Road
Fairfield, NJ 07006
(201) 575-7400

Cherry Lane Technologies
110 Midland Avenue
Port Chester, NY 10573
(212) 824-7711

Ensoniq
263 Great Valley Parkway
Malvern, PA 19355
(215) 647-3930

Forte Music
Box 6322
San Jose, CA 95150
(415) 965-8880

J. L. Cooper Electronics
2800 South Washington Blvd.
Marina Del Rey, CA 90291
(213) 473-8771

Passport Designs
625 Miramontes St.
Suite 103
Half Moon Bay, CA 94019
(415) 726-0280

Roland DG Corp.
7200 Dominion Circle
Los Angeles, CA 90040
(213) 685-5141

Sequential Circuits Inc.
3051 North First St.
San Jose, CA 95134
(408) 946-5240

Unicord/Korg
89 Frost Street
Westbury, NY 11590
(516) 333-9100

Cherry Lane Technologies: Maestros of Innovative Music Software

By Abigail Reifsnyder

Cherry Lane's inexpensive, easy-to-use music software for the Amiga places the most advanced sound technology literally at your fingertips.

Musicians and computers have traditionally inhabited different worlds. Artists need freedom and flexibility; computers, by contrast, need rules: nuance is not something they understand. In general, musicians have shown even more resistance to difficult-to-learn-and-use software than either graphic artists or writers. Furthermore, enabling a computer to make music has been an expensive endeavor—something many musicians can't afford—what with the price of a computer, an interface so it can understand instruments or voices and the necessary software (all this on top of the price of the musician's own instrument).

The Amiga is changing all that, and Cherry Lane Technologies, the one-year-old computer hardware and software division of music publisher Cherry Lane, is playing a key role in this change. What word processors have done for writers and spreadsheets have done for businesses, Cherry Lane believes it can do for musicians with a series of integrated music software for the Amiga.

"The Amiga is the machine that answers all of our questions," explains Cherry Lane Technologies President David Archambault. "It has superbly designed internal sound capabilities, the machine is relatively inexpensive, it has unbelievable speed and color graphics.... We see it as a real opportunity for us to develop a fully integrated, sophisticated package of music products right up front rather than a whole bunch of little pieces here, there and everywhere."

Harmony

The company's first release for the Amiga, *Harmony* ($79), appears on the surface to be a relatively simple accompaniment program. In fact, it is only simple in its use; what's going on in the machine is some very sophisticated sound production (courtesy of Amiga's sound chip) combined with artificial intelligence capabilities (courtesy of Roger Dannenberg, Research Computer Scientist at Carnegie-Mellon University) that allow the machine to actually listen to the performer and adjust its accompaniment accordingly.

The program offers a choice of songs (from the Beatles and Lionel Richie initially); the performer then selects one of the five parts to play or sing. As the music is displayed on the screen, the musician performs the part while the Amiga or a synthesizer attached to the Amiga generates the four-part accompaniment. If the musician slows down, the accompaniment slows down; if the musician plays softly, the accompaniment plays softly; and if the musician jumps ahead in the score, the computer recognizes this and jumps ahead too.

Dannenberg explains what's going on: "It uses some pattern-matching techniques to compare what you play against the score that's stored in the computer. That means you only have to get close to what's stored in the computer, so you're allowed to make mistakes and it will recognize them as mistakes and not be fooled. Then the output of this pattern-matching process tells the Amiga where you are in the piece so that the computer can tell if you're speeding up or slowing down and then do the appropriate things with the accompaniment. In a way, you can think of it as a computer model of an actual human accompanist...."

Binary Jam

Another important difference between this and other accompaniment programs is that the music was recorded into the computer by live musicians. "We are all very conscious of the musical needs of these programs as well as the technical needs," says Dannenberg. "If you've ever heard a computer performance of a piece

of music done mechanically, it sounds really lifeless because every single quarter note is exactly the same and all the notes are subdivided very precisely."

Having the music performed by real people gives it more life, making it more like a human accompanist. It also created one of the hardest problems for the Cherry Lane programmers to overcome, because the music displayed on the screen is not actually the music being performed. Each score is entered into the computer twice, once for the visual display and once for the performance. This is where the Amiga Interface technology becomes so important since the program must compare what you play to what it is playing to the graphics display of the score.

According to Bill Buxten, Research Scientist at the University of Toronto's Computer Systems Research Institute and consultant to Cherry Lane, "in many ways, [*Harmony*] appears to be a very simple program, but that's the point. The operation is almost trivial; it's *how* you use it. The assumption is that the benefits accrue in the process of using it and not in the fascination of figuring out how the damn thing works."

No Baloney

Archambault stresses the reasonable cost and accessibility of the program. MIDI interfaces and sophisticated synthesizers are not necessary. You can play a part using the Cherry Lane-developed and manufactured (and Commodore-marketed) keyboard, or you can use Cherry Lane's Amiga *PitchWriter* with a microphone to sing into the computer.

Cherry Lane is also developing a *PitchWriter* for guitars. Of course, an Amiga MIDI interface is also available ($49). "We decided a long time ago that we wanted to keep the pricing relatively low," explains Archambault. "The machines that people buy are expensive enough. We're selling to a market where, to a large extent, the musicians can barely afford their instruments. If, once they buy their instruments, we expect them to go and spend another couple thousand dollars on a computer, then another $500 to $1000 to get something to do with it, then we're just going to continue to limit the market. We decided this was just baloney."

Texture

This same philosophy of musical integrity coupled with ease of use and reasonable cost has characterized all of Cherry Lane's efforts for the Amiga. Its next product, to be released in the fall, will be an enhanced version of its *Texture* program ($199), previously released for the IBM PC and Apple II.

Texture was designed and programmed by Roger Powell, Cherry Lane's Director of Product Development and keyboardist for Todd Rundgren and Utopia. A sophisticated composition program, *Texture* grew out of Powell's own needs to be able to control synthesizers while retaining the spontaneity important to music composition. With a keyboard connected to the computer, the composer can play pieces of music which are then assigned to up to eight different tracks in the computer. Each track, as well as each individual note and event within the track, can be manipulated separately. All eight tracks taken together for a certain length of time form a "pattern," which can also be manipulated through various commands and eventually strung together to form a complete score.

"It's basically a toolbox," Powell says, "of a lot of different manipulations you can perform after you've recorded the material. For instance, you can rotate melodies within their boundaries so that the notes at the beginning appear at the end. You can scale the time of events so that one track will play everything with slightly longer times than the one underneath it. You can filter out ranges of pitch data you don't want, or perform transpositions so that what you record can instantly be played back in another key that may be difficult for you to play. You can alter the speed and tempo at any point. It also has a built-in editor that allows you to zero in on every single event on the track."

In its current IBM and Apple versions, the program is without a doubt sophisticated, but, like the early word processors, is also difficult for the computer neophyte to operate. "Obviously, the advantages of a more capable computer like the Amiga offer the real future of a program like this," Powell says. "What I have right now is this toolbox of all these commands and manipulations and special capabilities, and what we're really looking for is a more sophisticated user interface."

For example, in the current version, if you want to erase a section of a track, setting the boundaries and executing the deletion involves a whole series of prompts in which the composer must enter specific numbers to indicate positions on the track. Because the Amiga is more powerful, especially in its graphics capabilities, such tasks will be carried out by simply pointing with the mouse to a graphics representation of that track on the screen. This kind of change has the added advantage of clearing the screen—filled, in the current versions, by command and menu boxes—so that more of the musical score can be displayed. The Amiga's color capabilities will allow further enhancements such as color coding of certain operations or tracks so the composer will have to remember fewer commands.

> *Musical integrity, ease of use and reasonable cost characterize all of Cherry Lane's efforts for the Amiga.*

Piano Roll

Powell also plans to use "piano-roll" notation in the program instead of traditional music notation. A more intuitive form of notation, piano-roll notation is a grid ►

where the horizontal axis represents time and the vertical axis represents pitch. Notes are horizontal lines positioned according to their pitch and running along for a specified amount of time. Thus, if one voice plays middle C for four beats, it would appear toward the middle of the screen and be four units of time long. If a second voice were to come in halfway through at high C, its line would be at the top of the screen (to indicate the higher pitch), but beginning after two time units of the first note.

One advantage of this form of notation is that it makes it easier to see at a glance events that are occurring simultaneously. Since it is more intuitive, it also means that musicians who can't read music will still be able to compose. (Powell is considering programming an add-on module that will translate scores composed using piano-roll notation into traditional notation.)

Powell hopes to add a number of other features to the Amiga version. "I've got a list of about 16 other manipulations that I'd like to be able to perform on the note stream," he explains, "including a fair amount of automatic note generation. For example, if you have the grid on the screen and you draw a line across there with squiggles in it, it would generate a melody that would follow that basic trajectory. You could specify that the melody should happen not just as random notes picked off the keyboard, but that the notes would be coerced into fitting into a certain coherent scale. . . I can see a whole set of things like this where you wouldn't need keyboard input. And it opens up possibilities for musicians who play specific instruments because you're not locked into your own technique or your own biases that you've developed over the years. It gets more directly at the composition process, instead of having to filter all your ideas through a mechanical device like a keyboard. Basically, it's 'gesture-oriented' creation of music."

Nice Gesture

"Gesture" is a popular word around Cherry Lane. Bill Buxton, the designer of a soon-to-be-released traditional music notation program from Cherry Lane, developed his program (as of yet unnamed, unpriced) to be "gesture-oriented" from a desire to make computers easier to use. He explains: "One of the things that always struck me is that things like pop-up and pull-down menus often mean that it takes two or three steps to do what you should be able to do with one *gesture*. I wanted to develop software where you show the computer what you want in a manner that is really analogous to what I call "chalk talk"—what the coach does at half-time in a football game—where you circle the things you want and just drag them to where they go, much like the way you would lay out plays."

The implementation of the gesture concept in a music-writing program is amazingly simple: a music staff appears on screen with the insertion point indicated by a ladder going vertically through and extending above and below it. To place a quarter note, you simply move the mouse pointer to that spot, click down and drag up. Similarly, if you want to place an eighth note, instead of just dragging up, you drag up then down—as if drawing the flag on an eighth note. A sixteenth note is created by going up, down, then up again. In other words, you go up and down for as many flags as are on the note.

The other basic commands are equally straightforward. For example, moving, inserting or erasing single notes or blocks of notes is easily accomplished through simple operations with the mouse.

Next to simplicity, Buxten's objective was to show as much of the actual music on screen as possible. "Screen real estate is still at quite a premium," he explains, "so you don't want to have a lot of it taken up by all these commands and so on; you want to use it for useful information. By having this chalk-talk type approach, you get it right. You don't need to cover up material with command information because it's right there immediately at your fingertips."

Other Selections

Scheduled to be released around the same time as *Texture* is a sound sampling package whereby the computer digitizes a "sample" of any sound—noise, voice, instrument—and extrapolates it over the full range of the keyboard. This gives the keyboard player the ability to generate completely unique sounds, as well as real piano or trumpet sounds, etc., from the keyboard.

The company also has a line of educational music software, including an ear-training program, that it plans to port to the Amiga from the IBM PC and Apple II. Translations of existing software will not be their main thrust, however, because they feel the Amiga is capable of so much more than the machines for which these programs were originally created.

Significantly, all the programs Cherry Lane is creating for the Amiga use the same basic data structure so you can use them together. Cherry Lane coordinated their work with Amiga to make sure the structure corresponds to the Amiga's music software. By giving each program a reasonable price and making sure they work together, the company hopes that musicians who buy one program will come back for more. Future releases are likely to include such programs as a voice editor to modify sounds and switch instruments, and voice-library management to keep track of the "voices" created with the sound sampling.

Artistic License

One thing is sure: Both the company as a whole and its individuals are committed to the Amiga. Cherry Lane Product Manager Leo Clark sums it up convincingly: "I don't own a synthesizer; I don't have a computer. The only thing I have is an upright piano. But looking at the Amiga, I'll finally break down and take money out of my pocket and buy one. I don't like having my hands tied with music programs. Most of the programs we do remove constraints, but we're limited by the hardware. However, with the Amiga, you have so many options you can run wild. It's never good to tie an artist's hands, and the Amiga gives you freedom. That's the most important thing."

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Programming in C: Speaking the Amiga's Language

By Sheldon Leemon

You might say that the Amiga was responsible for introducing me to the C programming language. In 1984 I was fortunate enough to see an early prototype of what was then being called the Amiga Lorraine. I was of course impressed with the graphics and sound demonstrations. But I was even more impressed with the fact that those programs had been written in a high-level language called C. Up until that time, I had assumed that you just couldn't get that kind of performance out of a microcomputer without resorting to tedious assembly-language programming. Although I had heard a little about C in the past, I suddenly wanted to know a lot more.

Unix

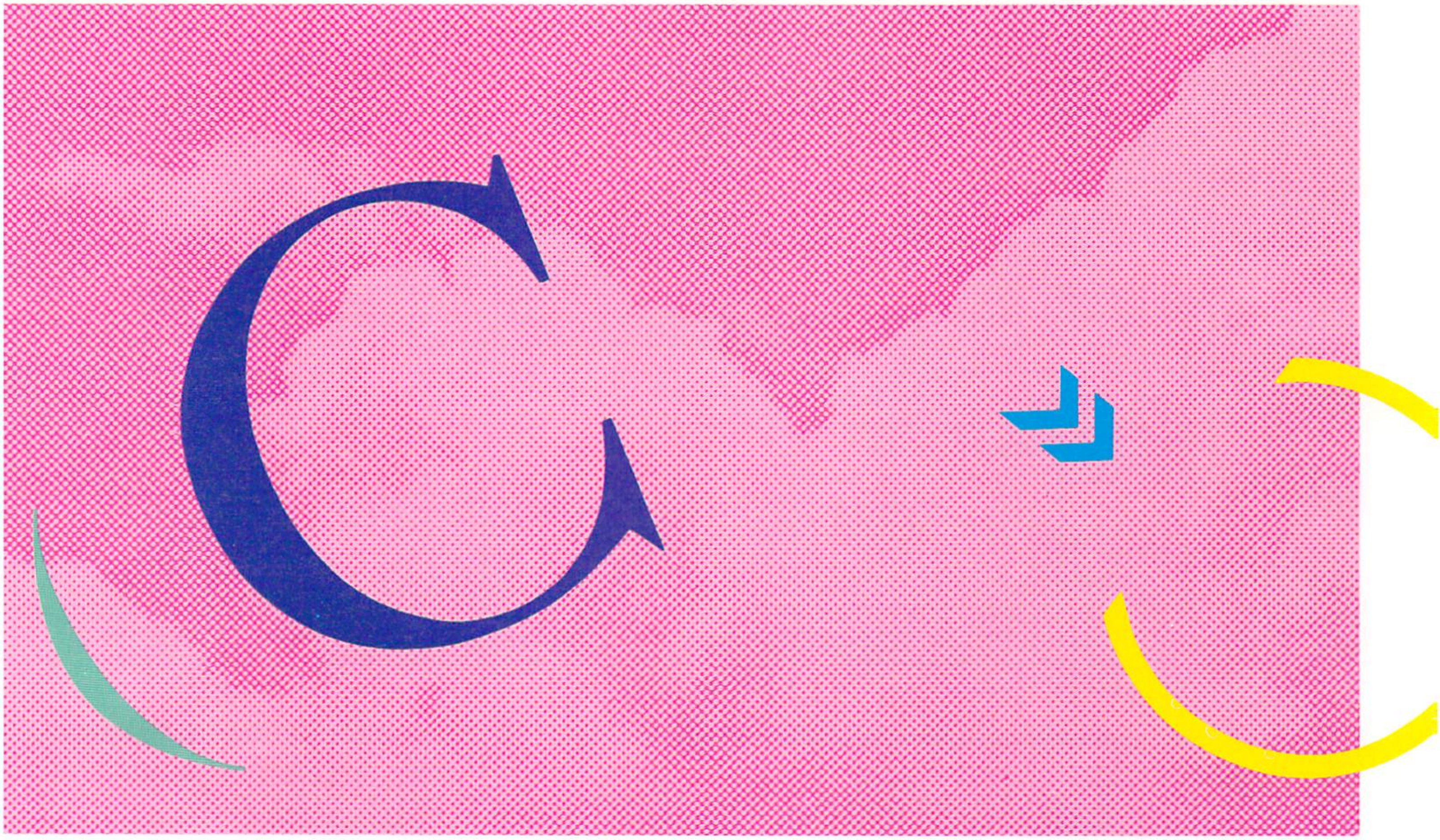
Even as late as a year and a half ago, however, there was not much information available for programming in C on microcomputers, at least not in books that appeared in my local bookstore. That's because C was designed as part of the Unix operating system, which is used mostly on mainframe and minicomputers. (Unix itself is written in C.) Though Unix is a very powerful and flexible operating system (developed by AT&T's Bell Laboratories subsidiary), it has not gained widespread acceptance for use on microcomputers as of yet. For one thing, Unix has a reputation for being so complex that only programmers who work with it day after day really get to know and like it. For another, the Unix operating system usually includes a host of utility programs, making the size of the complete system far larger than those commonly associated with microcomputers.

Language of Choice

While microcomputers have not advanced quite far enough to reach the point where they comfortably support Unix, they have certainly reached the point where they are ready for C. With older 8-bit micros, there are two factors that make assembly-language programming almost a necessity. First, these processors are relatively slow, so only machine-language programs run quickly enough to achieve acceptable performance. Second, these machines are limited to 64K of memory (without using tricky bank-switching techniques). Thus, they require the compact coding that can only be achieved through the use of assembly language.

When the IBM PC was introduced, it may not have represented a startling technological breakthrough, but it did at least present a system that used a slightly faster microprocessor and that allowed for more RAM and larger mass storage than was previously available. On the software front, this meant that developers had a more fertile environment in which to develop programs that were more powerful and easier to use.

Writing large, full-featured programs on the order of Lotus 1-2-3, however, is a massive undertaking. While assembly language affords good performance and com-



pact code size, it is very difficult and time-consuming to develop extremely large machine-language applications, and once such applications are developed, it is difficult to maintain and update them. What was needed was a language that offered some of the advantages of a high-level language, such as shorter development time and ease of maintenance, and yet produced programs that could fit in a 256K machine and offer good speed. For an increasingly large number of software developers, the C language seemed to offer the best range of features. As a result, C has become the language of choice for software development on the IBM PC and similar microcomputers.

Features

The C language has many features that make it a suitable language for software development. It is a modern, structured language. Its design philosophy is based on the use of subprograms called functions. Each function that you create is a small, self-contained program that performs a particular task. This allows the programmer to break down the overall task into manageable modules. Each module can be independently tested and debugged; when perfected, it can be incorporated into larger functions that perform more complex tasks. This modularity not only makes it easier to write and maintain programs, but it also helps to eliminate duplication of effort. If you are writing several programs that each require the user to enter some specific kind of information (such as an amount expressed in dollars and cents), you can create one general module that will prompt the user and accept the input, and use the same module in each of your programs. In fact, commercial libraries of such commonly-used modules can be purchased.

Another feature of C is the kind of output it generates. Most C compilers create machine-language code that uses the same format as assembly-language programs. Such programs may run faster than compiled languages that generate semi-interpreted code, and they do not require any special support programs to run them, making them easy to operate and easy to distribute. The programs created by a C compiler can be relatively compact. For one thing, C is not a big language. At the core level, C has only about a dozen keywords that could be considered commands. All of its input/output functions, such as printing to the display screen, are included as a standard library of functions. In some cases, it is possible to compile a program using only those functions that are actually used in the program, thus reducing the overhead requirements of the final program.

Although C is a high-level language, it works closer to the machine level than many such languages. It has a ►

number of operators that manipulate individual bit fields of data, which makes hardware-intensive programming easier. It also has good facilities for integrating machine language into a program to speed up those portions where time-intensive computation occurs.

Finally, C offers a fair degree of portability. Though in theory, there is not an "official" standard version of the language yet, in practice, versions of the language that are available for a wide range of computers, from micros to mainframes, are very similar. Of course, programs that include any kind of graphics generally use very hardware-specific display methods, making it hard to convert them for use on computers with different types of display hardware. Still, by isolating these display routines into a small group of distinct functions, C programmers need only to convert these functions to enable their programs to operate on another machine. This makes it much easier to convert a C program written for the IBM PC to the Amiga than it would be to convert a similar program from IBM Basic to the distinct Basic dialect used on the Amiga.

Amiga and C

In addition to the inherent virtues of the C programming language, the features of the Amiga are such that the computer lends itself particularly well to the development of software written in C. It has plenty of memory, both for creating and executing large C programs. Its use of large, special-function coprocessors to take care of time-intensive tasks, such as graphics display management and animation, sound and disk I/O, frees the main microprocessor to run at a high rate of speed. This means that some C programs which would execute too slowly on other microcomputers, will perform very well on the Amiga.

Another strong factor in its favor is that the Amiga operating system is designed to work with C programs. In fact, the operating system itself is partly written in C. One of the main features of the Amiga operating system is that it offers support libraries of functions that allow programmers to easily take advantage of its power to display and animate graphics and text, or produce sound and speech, etc. These functions are set up to mesh perfectly with applications programs written in C. In effect, C programmers can use the Amiga operating system as if it were a library of functions that are part of the C language.

Compiling C

Despite these many advantages, C is still used mostly by experienced programmers. There are several reasons why newcomers might feel intimidated by the language. For one thing, it is a compiled, rather than an interpreted, language. Using an interpreted language like Basic is a very interactive experience; it has a built-in

Lattice: The Developers of Amiga's C

When Commodore-Amiga set out to acquire a C compiler for the Amiga, they turned to Lattice Inc. While the name Lattice may not ring any bells with you, it is a familiar one to software developers. Hundreds of the best known programs for the IBM PC were written in Lattice C. Among them are dBase III, Wordstar 2000, the Smart Software System, the Perfect family of programs and the Sorcim/IUS line of programs, which includes SuperCalc3.

Beginnings

Lattice was founded in 1981, but its three principals, Steve Hersee, Francis Lynch and Dave Schmitt, had known each other for several years prior to its inception, having worked together in the software field. The company started with a compiler for minicomputers, and in 1982 released its compiler for the IBM PC. Though Lattice was itself a small company, the product was soon picked up by both Lifeboat Associates and Microsoft, who were able to give it widespread distribution. The IBM PC version of the compiler has won broad critical acclaim from the computer press, and its users currently number more than 30,000.

Steve Hersee, Director of Marketing for Lattice, attributes its success to what he calls "ego-less programming." "We're not interested in proving that we can write better code than anyone else," he says. "Our primary concern has always been meeting the needs of our users."

Although best known for its IBM PC compiler, Lattice has also done specialized software development for Tandy, Sony, Texas Instruments and IBM, among others. Nor is it a stranger to 68000-based systems such as the Amiga, having already developed C compilers for computers running under the CP/M-68K operating system, and for the Sinclair QL, a 68008 system popular in Europe. The compiler that Lattice developed for the Amiga is thus a mature product, even though it was written for such a revolutionary new computer.

The Family that Works Together

Hersee emphasizes that Lattice has developed a family of products that work together, numbering 38 in all. He is quick to point out that Commodore commissioned Lattice not only to write the native Amiga version, but also to develop Amiga compilers for the Sun Microsystems and Stride 68000 development systems and a cross-compiler that runs on the IBM PC. "This is significant," he said, "because it shows that Commodore is interested in supporting the whole spectrum of developers, from the smallest to the largest."

All of these versions of the Lattice compilers function identically, so developers who are familiar with any of them will have no problem using the Amiga version. Lattice has also made efforts to ensure that besides being internally consistent, its line of compilers

editor, and after you enter a line of code you need only type RUN to see the program execute. Some Basics even provide syntax checking on entry, so that you get instant feedback if you make a typing mistake. After running the program, if it doesn't function properly, you just list the bad lines, make some changes and run the program again.

With a compiled language, you must first compose the source code using a text editor. Then, you use the compiler to change the source code to object code. Finally, you use a linker program to convert the object code to an executable format. If an error occurs at any stage (due to a typographical error in the source code, for instance), the whole procedure must be repeated again until the compilation process is successful. Only then can you run the program to determine whether or not it does what you want it to do. If it doesn't, you've got to load your text editor and try again. This is a far cry from Basic, where you type PRINT "HELLO", and the computer simply does it.

Newer is Nicer

Lately, however, C has been made a lot more friendly for the less-experienced programmer. Very sophisticated program text editors are now available, some of which can even perform syntax checking, so that you don't have to wait until compiling time to discover syntax errors. Some interpreted versions of C have also appeared. These allow a programmer to develop programs in an interactive environment that is much more like Basic. The difference is that once programs have been written using the interpreter, they can then be compiled and run with a speed that Basic can't touch.

The atmosphere provided by the Amiga is much friendlier to such development than that of most microcomputers, even if you choose to use a C compiler instead of an interpreter. For one thing, the Amiga is a multitasking system. So instead of loading a text editor, a compiler and a linker in sequence every time you want to make a program change, it should be possible (if you have enough memory) to have each of these programs functioning *simultaneously*. Although compiling and linking is usually a multistage process, AmigaDOS allows you to set up batch jobs that will perform the whole process automatically. Finally, if you have enough memory, you can use the AmigaDOS RAM device to put your files in a super-fast RAM disk, which will speed compiling time dramatically.

"C"ing is Believing

Despite its reputation as a language for skilled programmers, C is not much more difficult to master than a language like Basic. Perhaps the best way to convince you is to show you an example of a C program. The following are listings of two programs, one in C and one in Basic. Each produces a temperature conversion table from Fahrenheit to Celsius in steps of 20 degrees Fahrenheit, which looks like this:

0	−17.8
20	−6.7
...	...
280	137.8
300	148.9

The C program is taken from page 8 of the classic text, *The C Programming Language*, by Kernighan and Ritchie.

```
/* print Fahrenheit-Celsius table
    for f = 0, 20,..., 300 */

main()
{
  int lower, upper, step;
  float fahr, celsius;

  lower = 0;        /* lower limit of tem-
                    perature table
*/
  upper = 300;      /* upper limit */
  step = 20;        /* step size */

  fahr = lower;
  while (fahr < = upper) {
    celsius = (5.0/9.0)*(fahr - 32.0);
    printf("%4.0f %6.1f\n", fahr, celsius);
    fahr = fahr + step;
  }
}
```

conform as closely as possible to industry standards, so as to afford maximum portability. They have made sure that their version of the language is in close conformity with the Unix System V standard. Hersee himself is a member of the ANSI committee that is currently working on standardization of the C language.

In addition to its C compilers, Lattice offers a number of programmer's utilities and function libraries, many of which should be available for the Amiga shortly after its release. Nor is Lattice alone in supporting its compilers with auxiliary programs. Outside vendors distribute dozens of such products, like "smart" editors that can perform program syntax entry, C interpreters that provide an interactive development environment for programs that will later be compiled and function libraries that provide the "building blocks" for applications like custom databases.

Fulfilling a Promise

While you may not be interested in programming at all, the availability of Lattice C and other C development tools, including cross compilers, for the Amiga is still very significant. Such widely used, well supported software development tools that encourage portability of programs from one microcomputer to another will spur the early production of the kind of software that fulfills the promise of the Amiga's powerful hardware.

Here is the equivalent program in the dialect of Microsoft Basic found on MS-DOS machines like the IBM PC:

```
10 REM print Fahrenheit-Celsius table
20 REM
30 DEFINT L,U,S
40 DEFSNG C,F
50 REM
60 LOWER = 0
70 UPPER = 300
80 STIP = 20
90 REM
100 WHILE (FAHR < = UPPER)
110 CELSIUS = (5/9)*(FAHR – 32)
120 PRINT USING "####" ;FAHR;
130 PRINT USING "######.#" ; CELSIUS
140 FAHR = FAHR + STIP
150 WEND
```

Basic Comparison

As you can see, the two programs are not all that different. Let's compare them line by line. To begin with, you will notice that the C program has no line numbers. The format of C is very free, and a single statement can take up one line, or many lines. This allows the programmer to make the program neat and readable. The first statement, which starts with the characters /* is a remark, corresponding to the REM statement in line 10 of the Basic program. In C, the remark can extend over many lines until the closing */ characters.

Next comes the line Main( ). This defines the function named Main. C programs are made up of functions, which are small subprograms. Every C program has at least one function, called Main, with which the program starts its execution. The parentheses after the function name show that it is a function. Some functions contain the names of variables that the function operates upon (called parameters) within these parentheses, but Main( ) doesn't use any, and thus is said to have an empty parameter list.

After the name of the function comes a { (brace) character. These braces are plentiful in C programs; they are used to mark the beginning and end of functions and the beginning and end of compound statements within a function. As shown here, most programmers use different levels of indentation to help group the various pairs of braces together.

After the initial brace come two strange looking statements:

```
int lower, upper, step;
float fahr, celsius;
```

These are roughly equivalent to the DEFINT and DEFSNG statements in lines 30 and 40 of the Basic program. To tell the truth, though, those Basic lines were added more as a point of reference than anything else. Basic is not a strongly typed language; you don't really have to specify to what kind of storage class a variable belongs (although most Basics give you the option to specify that it be stored as an integer and not in floating point representation). With C, these statements are not optional. Whenever you want to use a variable, you must declare ahead of time whether it's an integer, a floating point or a text character string. These declarations are made in a block at the top of the function definition.

When we compare the body of the program, we find that there are only two major differences. (One minor change in the Basic program was to change the variable name "STEP" to "STIP", because the former is a Basic keyword.) The first is that Basic uses the Wend statement to define the end of the While statement. C accomplishes this by enclosing the whole body of the While statement within braces.

The other major difference is the way in which the results are printed. The C program uses a function called Printf( ), which is not a part of the language program, but a part of the standard library of I/O routines. This is an example of a function that takes parameters; the text and variables that appear within the parentheses make up the data upon which the function operates. It performs roughly the same task as Basic's Print Using command.

The % and "f" characters are used to specify that a decimal number is to be formatted, and the numbers 4.0 and 6.1 are used to specify that the numbers are to be printed with four digits before the decimal place and none after, and six digits before the decimal place and one after, respectively. The Basic Print Using templates "####" and "######.#" do roughly the same thing. The C Printf( ) function allows for multiple substitutions, while separate Basic statements are required for each formatted column.

Not Hard to "C"

It should be clear from the above example that once you get past the formal requirements of function names, the braces and declaring variables, C is not as alien as you might have thought. This is not to say that C is just Basic in another disguise. There are a number of powerful features found in C that are quite different from Basic. However, there are enough similarities so that the beginning programmer can get started and can take in the differences little by little.

For most Basic programmers, these added features will be quite welcome. For example, C has a multitude of powerful math and logical operators. The statement Fahr + = Step; may be less recognizable than Fahr = Fahr + Step, but it is a lot easier to type. C allows you to use either form. Programmers used to Basic, where If-Then-Else statements are limited to a single line, will appreciate the fact that in C, If and Else clauses can contain as many statements as desired.

It is obviously beyond the scope of this article to acquaint the uninitiated with all of the delights of C programming. Hopefully, it will spur the interest of some readers enough to investigate further. The happy reader who does so will find much more material available than when I began a year and a half ago. Many of the larger bookstores have several C titles available; I've seen some with over a dozen.

Where to Look

The following bibliography is a somewhat random sampling of titles that I have seen recently. The Ker-

nighan and Ritchie book is the standard reference work; it defines the core elements of the language, and is often referred to simply as "K&R," or "the White Bible." It is a reference that belongs on every C programmer's shelf, but it is as dry as dust and definitely not a work to be approached lightly by the beginner. The next two books on the list are representative of the "first wave" of C books for microcomputer programmers. They are thorough yet understandable. The rest are newer, and though generally not as comprehensive (with the exception of Waite, Prata and Martin, which is 500 pages), they are very easy for the beginner to understand.

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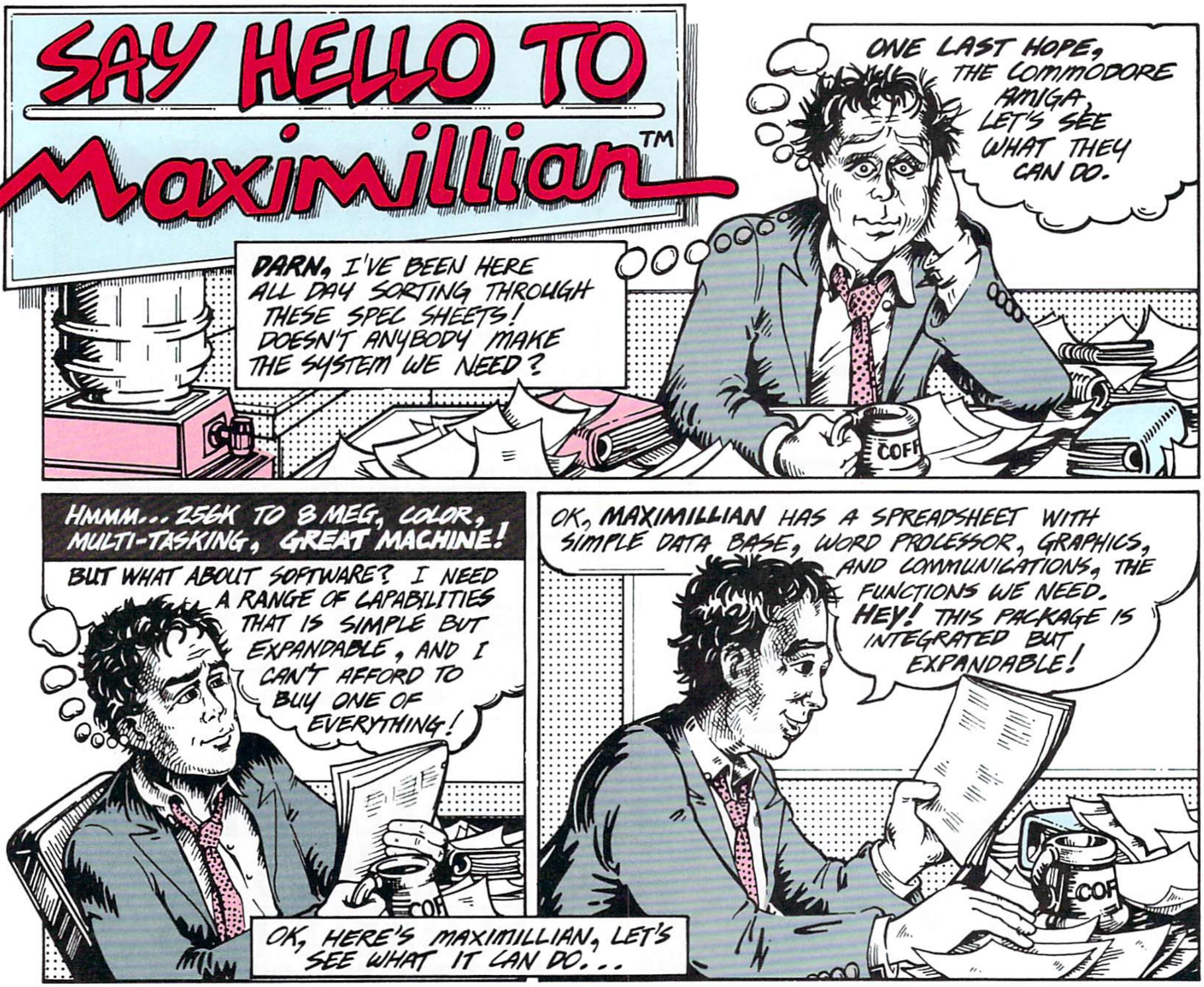
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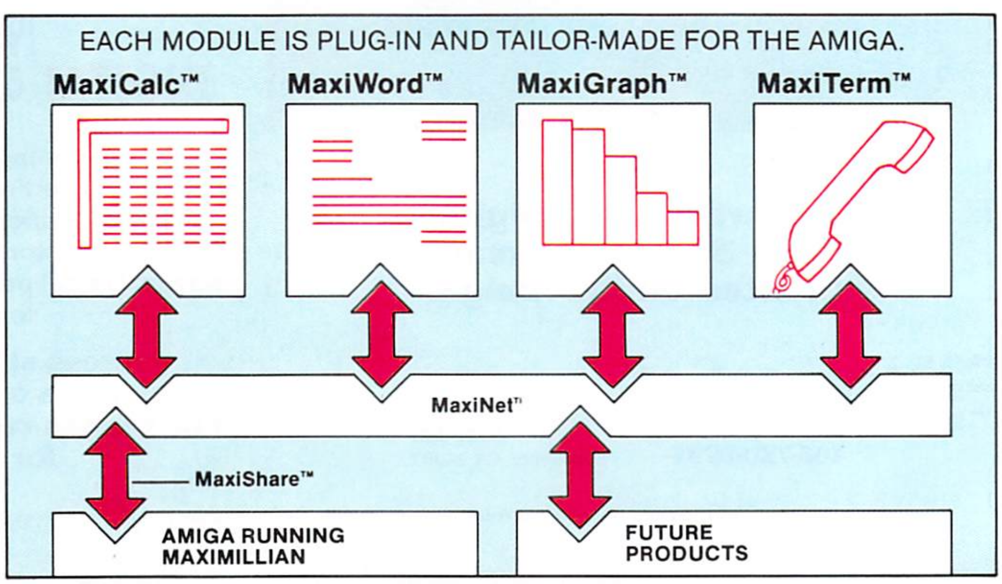
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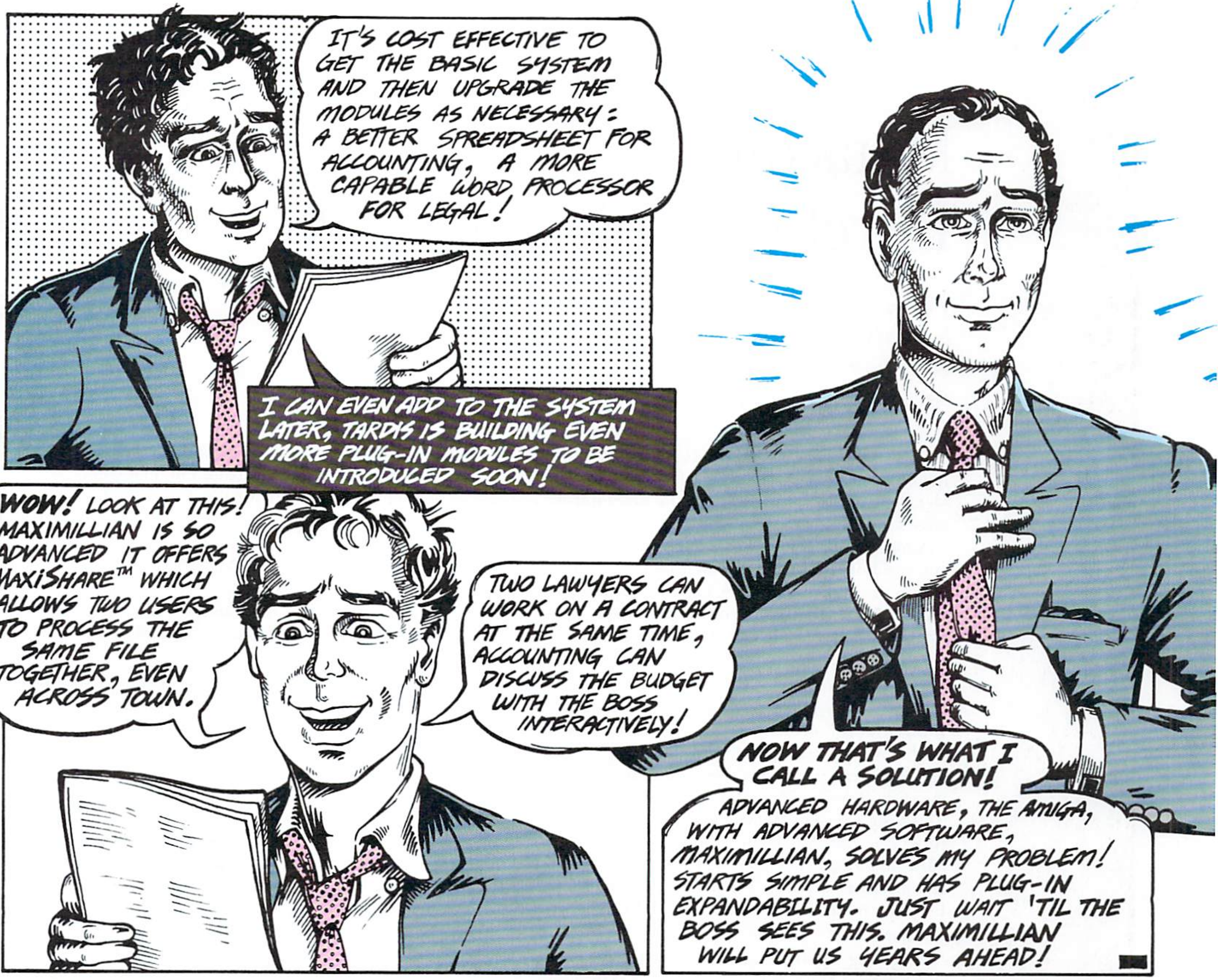
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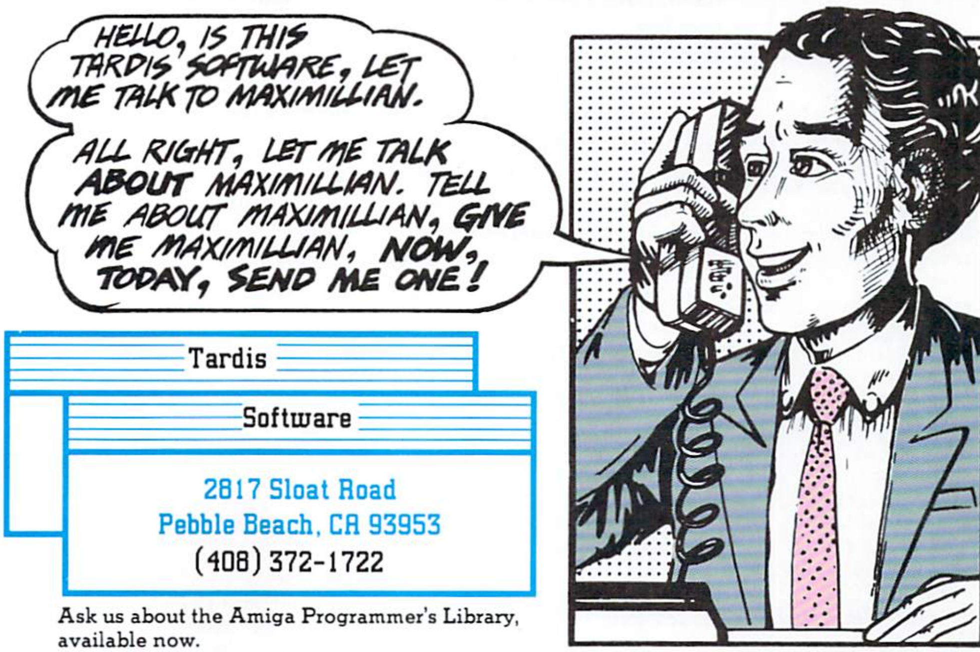
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Metacomco: Developers of AmigaDOS

The name might not be familiar to you, but this small English company is the first *name in systems software development for the Amiga.*

One of the surprises at the Amiga launch in July was the discovery that a small English software company, Metacomco, was responsible for the development of systems software for the machine.

AmigaDOS, a central component of the Amiga's advanced operating environment, was written at Metacomco. By launch date, they had also supplied Commodore with cross-development environments, a macro assembler, ABasiC, MCC ISO-validated Pascal and Cambridge Lisp.

Whence?

Metacomco was formed just over three years ago. A strong "flavor" of Cambridge University pervades the company—both of its technical directors, Dr. Tim King and Bill Meakin, received degrees there. Bill Meakin has overall responsibility for languages and compilers; Tim King oversees Metacomco's systems development programs. All of Metacomco's employees (about 25 in all) exhibit great pride in the company's reputation for technical development expertise. Located in Bristol, England, the company also has a base in California.

Who?

Tim King, 30, Director of Research and Development, joined Metacomco in 1984 after eight years at Cambridge University and three at the University of Bath. Tim did his doctoral thesis on relational databases and has a continuing interest in this area.

In contrast to his colleague's academic background, Bill Meakins' experience lies in the commercial and applications areas. One of the company's founders, he has spent most of the last three years developing a range of Basic interpreters and compilers for Metacomco, in conjuction with Digital Research.

Why?

Commodore chose Metacomco to develop the multitasking AmigaDOS because they wanted a company with extensive experience with state-of-the-art systems software. They also wanted a company that could meet the deadline (no small feat) and one that could port key programming languages for the Amiga by the launch. Metacomco delivered on all counts.

What?

What follows are descriptions of Metacomco's AmigaDOS, ABasiC, MCC Pascal and Cambridge Lisp. It should be apparent that their pride in "technical development expertise" is well founded.

AmigaDOS

AmigaDOS is a multiprocessing operating system that allows many jobs to take place simultaneously. Each AmigaDOS process represents a particular process of the operating system (e.g., the filing system). Only one process is running at a time, while other processes are either waiting for something to happen or have been interrupted and are waiting to be resumed. Each process has a priority associated with it. The process with the highest priority that is free to run does so; processes of lower priority run only when those of higher priority are waiting.

In developing AmigaDOS, Metacomco drew heavily on an English operating system developed at Cambridge University, called Tripos. Tripos was designed as a powerful tool for computer science research.

A process called Command Line Interface (CLI) is provided for use in AmigaDOS. CLI processes read command names and then execute them. Commands and user programs run under a particular CLI, or under the AmigaDOS Workbench. It's possible to have multiple CLIs, each associated with a separate screen window. The CLI accepts standard command lines, which can include command files with parameter substitution and command I/O redirection.

AmigaDOS gives the worn-out phrase "user-friendly" new vitality. Whenever something goes wrong, for example, typing WHY displays the reason for the failure. If the format of a command is forgotten, typing "?" after the command in question displays its template.

AmigaDOS has about 40 user's commands. These include file-utility commands (including a screen and a line editor), CLI control commands, command sequence control commands and system and storage management commands.

The filing system is hierarchical with no preset limits. Files and directories are unlimited in size, number and depth; only the simple names are restricted (to 30 characters). Other features include file comments and assignable file protection status.

AmigaDOS is "safe." Each block has a header that points to both the next and previous blocks. Therefore, an entire disk can be re-created from one good block. To do this, the one good block is used to trace back to the core directory in a central track on the disk; from there, the pointers to all the other blocks can be recreated.

Several physical devices and some logical devices are provided by AmigaDOS. The physical devices include the printer (PRT:), disk drives (e.g., DF0:), serial and parallel ports (SER: and PAR:) and the RAM disk (RAM:), to name a few. Logical devices are used to find certain files that your programs may need. These devices use standard names that can be reassigned by the user to reference any directory.

The following languages are supported by AmigaDOS: C, ABasiC, MCC Pascal 68000 and Cambridge Lisp (Metacomco); Amiga Basic (Microsoft); and TLC Logo (The Lisp Co.). It also supports a macro assembler and a linker.

ABasiC

ABasiC was specially designed to access the Amiga's graphics, sound and speech capabilities, and is, therefore, an excellent introduction to the powers of the machine. It is a port of Metacomco's Basic 68000 interpreter with extensions and alterations.

The usual features of an interpretive Basic are provided in ABasiC: three numeric data types (integer and IEEE single- and double-precision float), arbitrary length strings, arrays and serial and random files. In addition, the LIBCALL function provides access to the Amiga's ROM libraries, as well as any written by the user.

With the planned introduction of a compiler, ABasiC is an excellent tool for the development of commercial applications, as well as for personal use. The most prominent features are, however, the graphics, sound and speech extensions built into the language. With these it is possible to write remarkably short and simple programs that create sophisticated effects.

Some of these commands will be familiar to Basic users, but be careful—they have additional parameters that add a great range of control and flexibility.

The Screen statement defines a custom screen, allowing definition of resolution and color depth. Window creates a window and, as an added feature, associates it with a Basic file number. The window in which text and graphics are to appear can be selected by setting the default file for the output.

Draw and Area draw and fill arbitrary polygons, and Pattern and Linepat set fill and line styles, respectively. PenF, PenB and PenO set area foreground, background and outline pen color registers. RGB sets the actual color representation in a color register. SShape reads a rectangle from the screen; GShape writes it out.

Graphics objects can be saved in disk files in combination with the file commands (RGet, RPut or BLoad and Bsave). Sound uses the sound generators on any combination of the four audio channels.

Some unusual commands are: Animate, which creates a moveable image and sets it in motion; Translate and Narrate, which make Basic programs garrulous; and Wave, Period and Volume, which control sound generation.

MCC Pascal 68000

Pascal was originally designed as a teaching language and has become the most popular general programming language in computer education. MCC Pascal 68000 meets the international standard ISO 7185 level 0 and has been validated by the British Standards Institute. As an implementation of the standard, it will be of ►

interest to educational establishments and to any developers seeking portable code.

MCC Pascal is a one-pass native code compiler. The translator provides clear, helpful error messages in the case of syntax errors. One unusual feature is the provision of a runtime debug package. As an option, the translator produces "slow" code, incorporating checking and line number information. The source lines in which errors occur are identified at runtime.

Subroutines written in C are accessible through MCC Pascal's C interface. These include the whole of the Amiga's graphics, sound and speech libraries.

Cambridge Lisp

Lisp is one of the oldest computer languages, having been developed in 1957. It is a non-algorithmic, symbol-processing language used often in artificial intelligence research. It offers a flexibility of data and control structures unavailable in other languages.

The popularity of Lisp has been growing along with the rising interest in expert systems, a practical application of artificial intelligence research. Lisp has been used extensively as a base language for expert systems development.

The provision of the full-function Cambridge Lisp on the Amiga represents a further step in the movement toward providing expert system development tools for use on microcomputers. Cambridge Lisp 68000 is a member of the standard Lisp family, and it is similar to Portable Standard Lisp.

Cambridge Lisp helps in program development in a number of ways. Using its Interpretive mode together with the trace package, the programmer can quickly and efficiently develop and debug programs. It checks for exceptional cases and provides clear diagnostics. Full tracing is available in both interpreted and compiled code, and the core image may be dumped to aid in debugging. The control structure of Lisp, which includes recursion and function composition, allows the programmer to use a "top-down" approach to break complex functions into simpler units.

A large number of built-in functions are offered by Cambridge Lisp. The compiled and interpreted functions can be used interchangeably, and, once developed, a program can be compiled to improve its operation speed.

Conclusion

Hardware and software must be jointly developed for a high-performance multi-tasking DOS implementation to be successful—in computerese: You can't retrofit concurrency. Metacomco rose to the occasion. In tests, 50 tasks have been run simultaneously in different windows under AmigaDOS.

The people at Metacomco had the benefit of state-of-the-art design when they did their systems development for the Amiga. Their contribution of AmigaDOS, as well as numerous optimized programming languages for the Amiga, should greatly benefit the success of this very unique computer.

Address all correspondence to AmigaWorld *editorial, 80 Pine St., Peterborough, NH 03458.*

Digital Canvas

Digital Canvas is designed to be a showplace for Amiga artists. This issue features the work of Sheryl Knowles, Senior Graphic Artist at Commodore-Amiga.

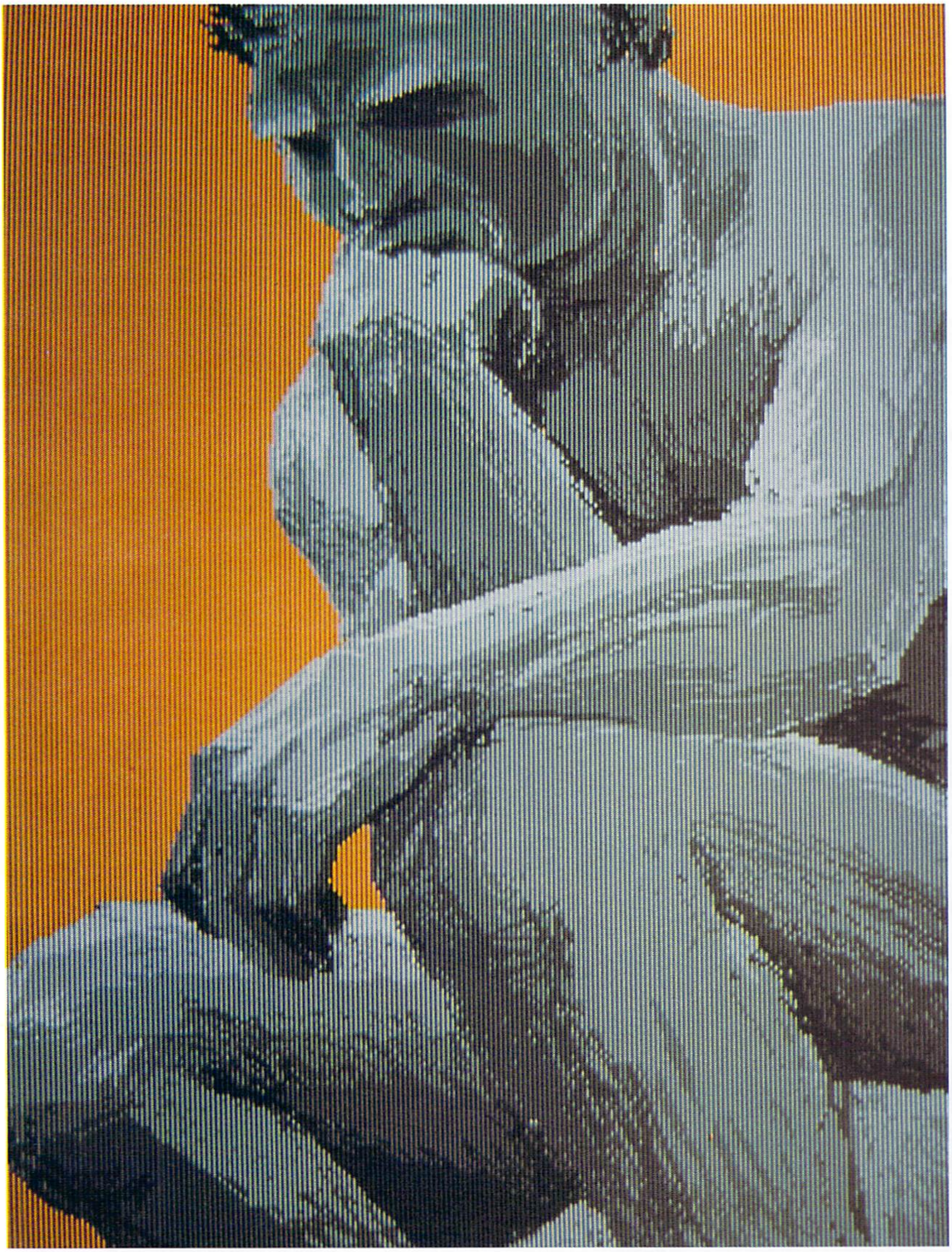


Sheryl graduated from Oregon State University with a BS in Anthropology and minors in art, computer science and Asian studies. She moved to California in 1975 where she began her career as a commercial artist and freelance illustrator, doing a little of everything: business stationery, advertising, paper-doll design, book and comic-book illustration.

In 1983, Sheryl became Amiga's first artist, producing artwork for demos, user-interface design, icons and fonts. . . and just for fun, to push the machine to its artistic limits.

Sheryl is enthusiastic about the possibilities that the Amiga offers for artistic expression. "Computers are not traditionally considered to be artist's tools," she says. "But the Amiga is revolutionary in that it will make the computer a reasonable tool for an artist. And because it will be available to so many people, more people than ever will discover their artistic abilities.

"I'm a traditionalist. I like the old masters. I don't see how computer art differs very much from conventional art. What you can do with paint and a canvas you can also do with pixels and a monitor screen. The principles are the same."

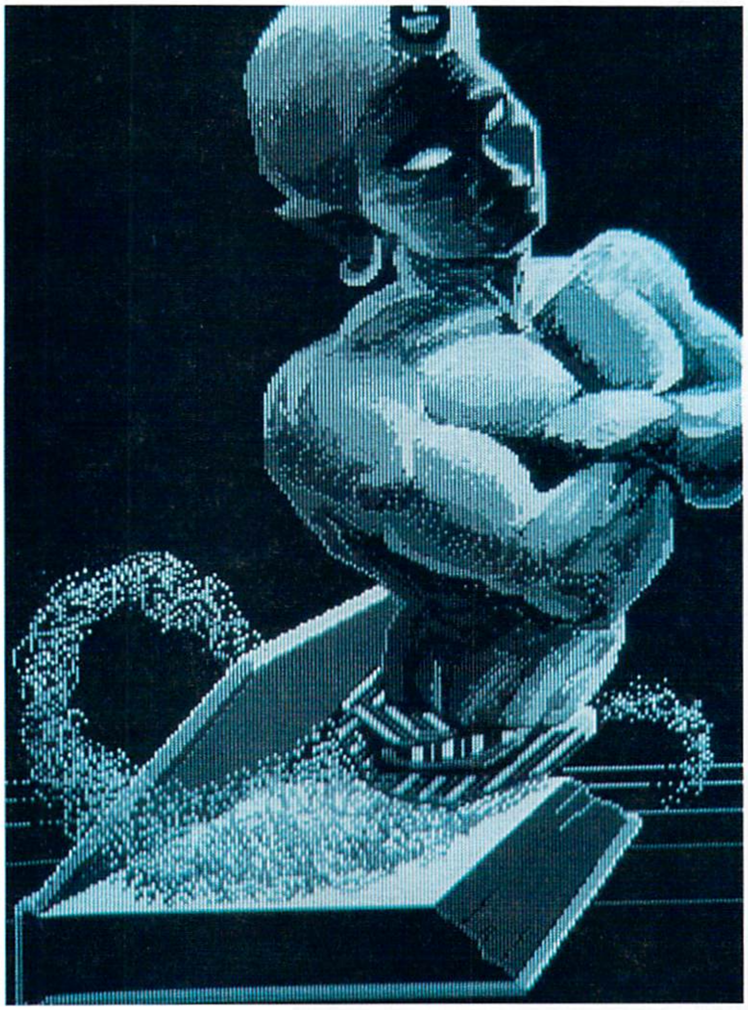




"What you can do with paint and canvas you can also do with pixels and a monitor screen."

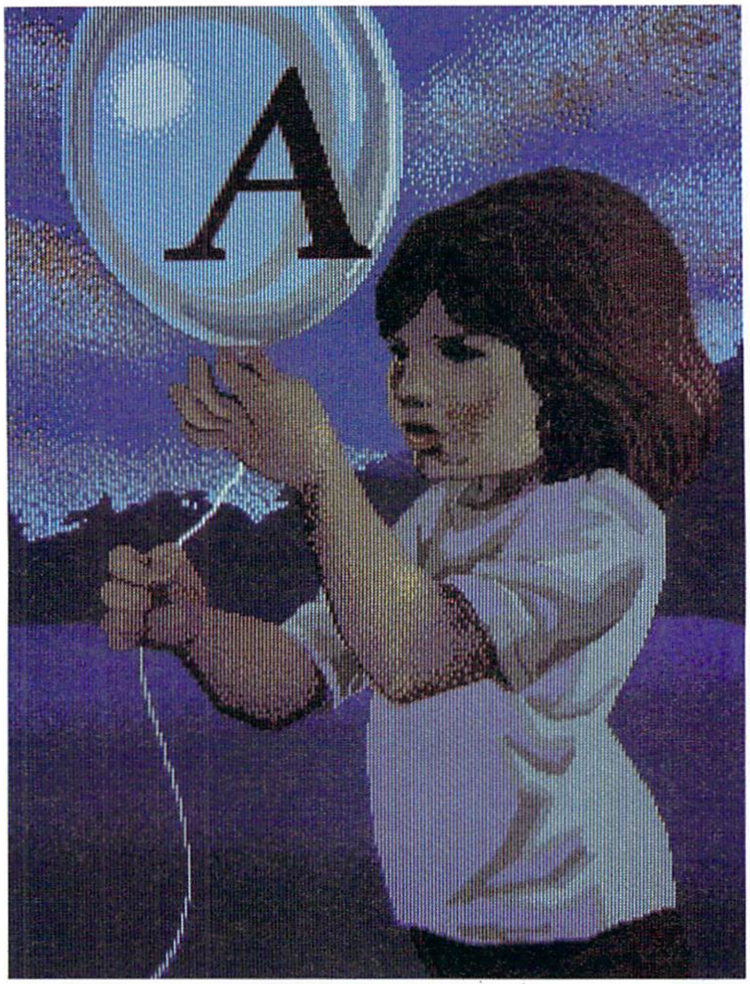


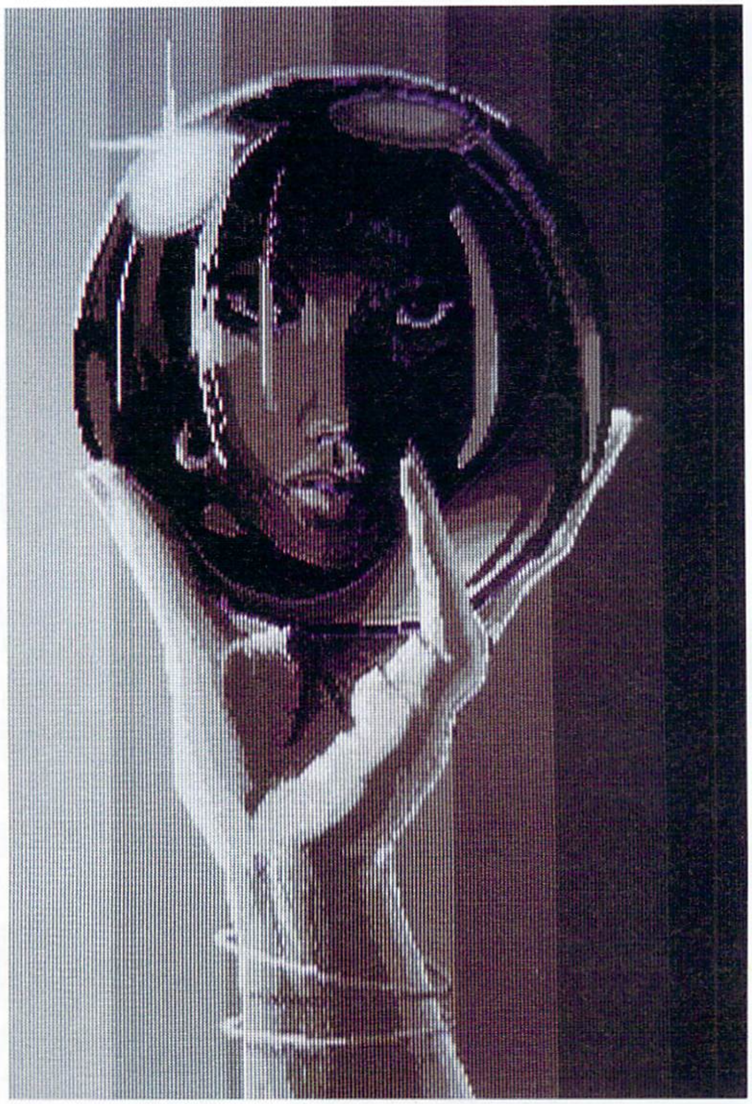









A





Protocol

By George Por

Protocol is designed to help you tap the potential of your Amiga as a telecommunications tool—for business, pleasure and profit.

If you're among those smart enough to know that they can become even smarter by using the Amiga for telecommunicating, then you should enjoy reading Protocol. Our key criterion for picking communications products, people and applications to write about is: Will the story inspire someone to try new things that can enhance one's work or add more pizzazz to one's life? You'll tell us whether or not Protocol is meeting that standard.

As we approach the end of this millennium, we're facing situations that one can see alternatively as crises, or as challenges and opportunities. Those with flexible communications systems will tend to be the winners. Learning how to unleash the power of the Amiga as a far-reaching communications tool can be your winning ticket in the years to come.

There are some technical extras built into the Amiga. Most of the personal computers on the market can perform the same basic communications functions, provided that you have the right software. Beyond the basics, the Amiga has in store for you opportunities not available to users of any other micro. For example, you can: increase the usefulness of text or other files you receive online by color coding them for easy identification and retrieval; work on other programs while in Terminal mode without wasting expensive connect time; and send electronic greeting cards with sound to Mom for her next birthday, just to mention a few.

Once you look into the more serious things you can do with the Amiga, such as accessing some of the mushrooming on-line communications, transaction and information services, you'll be dazzled by your options. You might even begin to feel the effects of information overload. The best way to avoid this is to decide what *you* want to hear about, what *your* priorities are, and match them with what is available. To facilitate this decision making, we've compiled a list of Amiga-oriented telecommunications topics that might appear in future issues.

Modems

When you want the Amiga to "talk" to any other computer outside your premises, you need a device that translates its digital signals into analog signals that the phone system can pick up and forward. That device is a modem (*mo*dulator/*dem*odulator). Modems come with many different combinations of a variety of features. Before deciding which one to buy, you may want to find out, for example, what it would imply to get one with transmission capacity roughly equal to 300, 1200 words per minute, like Commodore-Amiga's own 1200 RS, or 2400 words per minute, such as Tecmar's T-Modem. This and many other modem questions will be answered in upcoming Protocol installments.

Communications Software

Communications software falls into three different categories: access, host and terminal software. Access programs are tailored to "talk with" specific on-line databases, such as Dow Jones, Dialog or Lexis/Nexis. A host program is what you need when, for example, you want to set up a neighborhood bulletin-board service. You'll probably have to wait a while before seeing access and host software for the Amiga. Terminal software does the postman's job by delivering messages and

Photograph by Edward Judice

files to and from your computer. Fortunately, terminal programs, which are used the most frequently, are already here. We might even have a review of one in our next issue.

Nuts and Bolts of Getting Ready to Communicate

If you think hardware (the Amiga itself and a modem) plus communications software are all you need to go on-line, then you're in for a surprise. "Brainware" is even more important than hardware or software; this includes knowing how to set the switches, how to reduce connect-time charges and how to shorten your learning curve.

What You Should Know about "Telelaw"

Since millions of modems are whirring in American homes and offices, state and federal legislators have started to figure out what they should regulate and what they shouldn't. It's not an easy job, because no one can predict the long-term implications of any law related to a fast-changing industry and volatile telecommunications usage patterns. We'll keep an eye on what "telelawmakers" are cooking up and will talk more about it later.

The personal or business network that you form with your Amiga is a hotbed of promising ventures and new, more effective forms of human communication.

Bulletin-Board Systems

Bulletin-board systems (BBSs) are the information-age descendants of the good ol' grocery store bulletin boards. You can use them for a variety of purposes, such as buying and selling, finding a roommate, swapping public domain programs, playing computer games and sharing the latest news on Amiga products. Recently, numerous corporations started to use bulletin boards for on-line press conferences, customer and shareholder relations and other internal and external public relations functions. From time to time, we'll give you a rundown of Amiga-oriented BSSs and some novel applications for them.

Electronic Mail Services Compared

Using electronic mail, you can put the letter or document that you've just written in the hands of an addressee within minutes. Think of the difference it can make in the use of your time! The battle is heating up among e-mail giants. You, their current or future customer, might well benefit from it. The increasing competition between MCI Mail, Federal Express' Zap Mail, Western Union's EasyLink, General Electric's Quick-Comm, ITT Dialcom and the others may bring lower prices, but it will still be up to you to figure out which of them offers the mix of features most suitable to your working conditions and communications needs. Reading a comparative overview of them in Protocol may save you hundreds of hard-earned dollars in consulting fees.

Computer-Assisted Group Communications

If you are a member of any geographically dispersed group—a bi-coastal family, a research team, an international association, a multisite task force, etc.—and you need to generate group synergy in spite of the distance, computer-assisted group communications systems are the answer. There are 25 vendors selling or licensing the software that manages group communications traffic. We will report to you on both state-of-the-art developments and interesting uses of these text-based conferencing systems.

The Land of LAN: Local Area Networks

Let's say people in your work group are located in the same building and you're looking for a set-up whereby each of your computers can send and receive documents to and from one another. You may want to have each computer share expensive peripherals instead of buying a laser printer or an optical disk drive for each of them. What you are looking for is called a Local Area Network (LAN). What LANs are available for Amiga users? Who supplies them? What are the advantages and drawbacks of local vs. distributed network architecture? Answers to these questions may be forthcoming in future issues.

The Big Three of Electronic Utilities

The Source, CompuServe and Delphi are the three largest electronic on-line utilities, providing hundreds of information, communications and transaction services to a quarter of a million people. The ways in which you can use these huge electronic utilities are limited only by your imagination. You can buy and sell stocks, read the latest editions of newswires, chat with the editors of electronic magazines, download programs of interest to you or join or form an on-line group of Amiga users. Each of these three biggies is so unique that it deserves a separate article reviewing its offerings.

The Videotex Connection

In a few years, when we look back at 1985, we'll say it was the year of the Amiga in desktop computing and the year of videotex in personal computer communications. We will have seen: videotex systems allowing transmission of both text and graphics between the Amiga and a host computer; banking and shopping without leaving home; and ordering dinner from menus visually displayed on screen. We'll discuss the promises of videotex and services that start to fulfill them.

Electronic Libraries

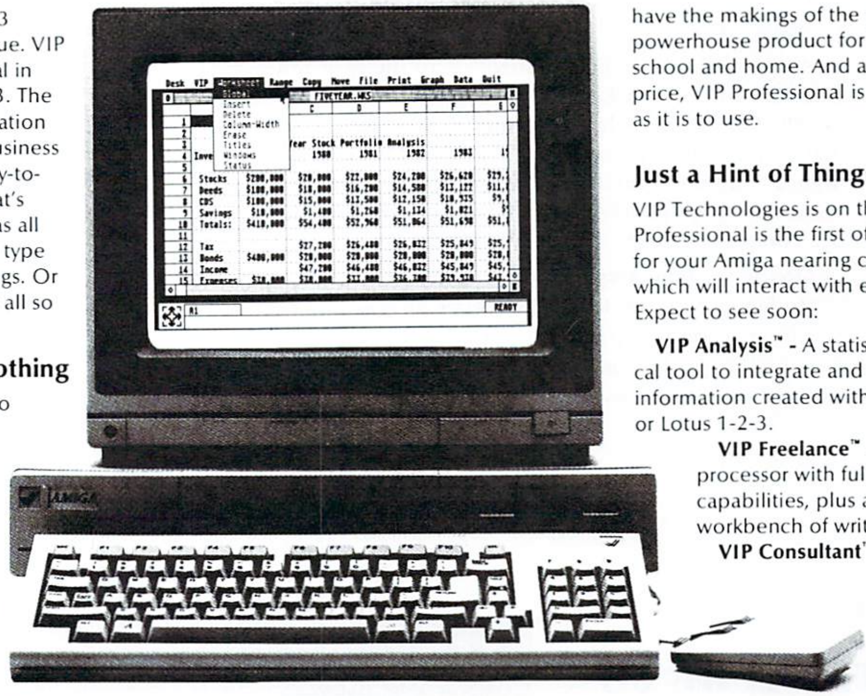
There are about 2,500 commercially available on-line databases that you can access with your Amiga. All aspects of human knowledge are covered, from busi-

Circle 27 on Reader Service card.

VIP Professional™

We Jazzed Up Lotus 1-2-3™ For Your Amiga™ PC

The universal dream - to have 1-2-3 power on your Amiga has come true. VIP Professional* is a program identical in features and commands with 1-2-3. The same spreadsheet analysis, information management and extraordinary business graphics. All combined in one easy-to-learn, easy-to-afford package. What's more, VIP Professional not only has all the features of 1-2-3, you can also type the same keys to do the same things. Or better yet, use a mouse to make it all so much simpler.



Not Just 1-2-3 in Mouse Clothing

VIP Professional is totally faithful to the 1-2-3 standard. In fact, you can send "1-2-3" files created with Professional to be used with 1-2-3 itself, or with versions of Professional on the Apple //, the Macintosh, the Atari ST, IBM's even UNIX computers. But like the Amiga itself, Professional also has the spirit of a daring maverick. Just as the Amiga outstrips the power and performance of the business computers, VIP Professional meets and outfeatures Lotus. Compare for yourself:

Feature	VIP	1-2-3
123 Commands	Yes	Yes
123 Graphics	Yes	Yes
123 Database	Yes	Yes
123 Macros	Yes	Yes
123 Files	Yes	Yes
Enhanced Graphs	Yes	No
Uses mouse	Yes	No
Drop-Down Menus	Yes	No
Icons	Yes	No
Intuition™ Interface	Yes	No
Multiple windows	Yes	No
Available on Amiga	Yes	No
Easy to use	Yes	No
Affordable	Yes	No

Call It Intuition

VIP Professional is easy to use because it takes advantage of the Intuition environment and other elegant features built into the Amiga. Throw in lots of help, a thoughtful tutorial for the novice, and a thorough reference manual, and you have the makings of the perfect powerhouse product for the office, school and home. And at the super low price, VIP Professional is as easy to afford as it is to use.

Just a Hint of Things to Come

VIP Technologies is on the move. VIP Professional is the first of several products for your Amiga nearing completion, all of which will interact with each other. Expect to see soon:

VIP Analysis™ - A statistical and analytical tool to integrate and manage information created with VIP Professional or Lotus 1-2-3.

VIP Freelance™ - A complete text processor with full formatting capabilities, plus a complete workbench of writer's tools.

VIP Consultant™ - A project management program to help design, organize and implement any complex task at hand.

VIP Forethought™ - An outline processor useful for organizing any mental activity.

Our software will make your Amiga investment one of the best you have ever made.



VIP Professional will do your finances, keep your inventory, graph your sales, and a whole lot more.



Although VIP Professional will sell for $199.95 after Feb. 1, '86, as a special introductory offer, you can get this product for the low price of:

$149.95

If Your Dealer is Out of Stock, Order Direct.

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Mail orders: For shipping and handling add $3 in the U.S. ($6 Canada; $20 overseas). California residents add 6% sales tax. COD's and Purchase Orders WILL NOT be accepted. Personal checks will be held for three weeks to clear. All prices are subject to change without notice.

* 512K Recommended

Software Submissions Encouraged

vip TECHNOLOGIES

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ness, science and law to politics, religion and current affairs. The hardest thing is figuring out where to find what you need to know. We'll share with you a few simple but effective tricks of the trade.

Get a "Teleducation"

Computer-assisted learning is a new way to earn a degree, learn about the secrets of French cuisine from a native chef or refresh your knowledge of anything taught in the hundreds of courses offered on-line by many academic and non-academic institutions. In Protocol, current users of this new educational vehicle will tell you what to expect as an on-line student or teacher.

"Telework"

A recent Pacific Bell ad states, ". . . in the next few years, in the greater Los Angeles area alone, there will be 800,000 people telecommuting to their jobs, using light-wave highways instead of freeways." Even if this figure is inflated, PacBell is right on track. Each year there are more people who send their work from home via computer to the corporate switchboards.

Electronic Networking for Fun and Profit

Modems, software, LANs and other technical issues wouldn't really be worthwhile if they didn't enrich your personal or professional life. Electronic networking is a new game in which every participant can win. The personal or business network that you form by using your Amiga as a telecomputer is a hotbed of promising ventures and new, more effective forms of human communication.

The Future of Amiga Communications

The Amiga is the only true multisensory telecomputer on the market. What is a multisensory telecomputer? Try to picture yourself in a situation in which you have to instantaneously convey a complex message to a geographically dispersed audience. The Amiga gives you a dazzling array of bright colors, high-resolution animated graphics, text, voice and stereo music to combine into a powerful message.

Multisensory personal and business communications open to us opportunities of unpredictable scope. Protocol readers may take the lead in exploring and creating those opportunities. You'll be among the first to know what third-party developers are preparing for Amiga's videoport. Also, be sure to write to us about your own telecommunications applications.

How to Reach Protocol

These topics are a sampling of what we have in mind for future issues. Let us know what you think. If you have a modem and a subscription to The Source or CompuServe, you can drop a line to our electronic mailbox. Of course, USPS mail is welcome as well. Please address any suggestions, thoughts or comments to *AmigaWorld* editorial, 80 Pine St., Peterborough, NH 03458.

See you on-line!



Photograph by Edward Judice

Accountability

Keeping Track of Small Businesses

The image of accounting. Ho hum. That about sums up the image of accounting for most of us. Thick, boring books filled with numbers and used only by big companies at tax time to find loopholes. Understandable only to CPAs and IRS auditors—small, humorless men with bow ties, glasses and zero personalities. A tedious but necessary evil of businesses everywhere. Accounting is keeping track—keeping track of money or numbers or inventory or debts or orders. The fanciest accounting software in the world is not going to make the business of accounting any more exciting or fun, but in order to justify the existence of any computer in the business market, there has to be some sort of accounting software available. After all, that's what computers were invented for.

Accounting software varies greatly. From phenomenally complex programs that do more than any business could posssibly hope for at high costs in both purchase price and time involved with learning the program and maintaining the system, all the way down to semi-adequate programs with cheap price tags and cheap results. Neither option is particularly attractive to the businessperson looking for an accounting package. Most people who are in the market for accounting software want to make one purchase without a lot of fuss and have the software perform up to their expectations.

If that means spending extra money, then in many cases, the money will be spent. But there are problems. An expensive package implies a comprehensive package, and that implies a complicated piece of software that is going to take a long time to learn (unless you are already an accountant, in which case you already know exactly what you want). On the other hand, a simple program may not be comprehensive enough to do all the things that a businessperson might require. There are also the problems of transferring existing records over to a new system of accounting, deciding on the proper hardware configurations to do the things required, and, for most of us, there is a problem of learning enough about accounting in the first place in order to make an educated decision. Let's assume that the computer to be used will be an Amiga. The hardware questions then become ones of memory, storage and printed output.

First Things First

Various "experts" have said that it is better to shop for the software first and then get a computer that can run the packages that you want. There is a lot to be said for this approach, but there should also be a caution here. Just because a particular software package is the best for doing something on a particular computer, it may not be the best software of its kind running on any computer. The best accounting software that runs on a $70 computer may not be the best accounting software anywhere, and the best accounting software that runs on a $700 or $7,000 or $70,000 computer may not be the best for your particular needs. So where does that leave us? First, perhaps, we should determine just who needs accounting software.

If you run a multibillion-dollar company with hundreds of employees, then you probably already have a few full-time accountants working for you and they have devised a system that works, so you don't need any advice. Besides, anything that runs on a microcomputer probably wouldn't fulfill your needs anyway. At the other extreme, if you work at a pizza parlor as a dishwasher, live by yourself and walk to work every day, then accounting software is probably not high on your list of priorities. But, if you fall somewhere in between these two examples, then it might be worth your while to investigate computer accounting.

The people who will benefit most from an accounting package are those who could be stereotyped as entrepreneurs, yuppies or one of the many in the great sea of self-employed small-business people: consultants, small manufacturers, farmers, ranchers, people with ►

Software Virtuosos Will Compose Masterpieces for the New Amiga

By Dash Chang
President, Chang Labs

Amiga's Speed, Color, Graphics and Sound Capabilities Promise a New Generation of Easy-to-Comprehend Applications

The Amiga can be likened to a Steinway grand piano. A good pianist will produce good music from a Steinway, but a virtuoso will use it to impart his unique, magnificent interpretation of the world.

Similarly, a good software house will develop good applications that make the Amiga perform, but a great software publisher will compose masterpieces for the Amiga that touch the soul and delight the senses.

New standards in graphics, color, sound and speed promise to bring excitement to the Amiga, the first real innovation in personal computing since the Macintosh. However, before any truly innovative applications bestow the full promise of the Amiga, a bit of time will pass. So it goes with all new, standard-setting inventions.

The software virtuosos who will emerge for the Amiga will create programs that are not only easy to use but easy to comprehend also. At the same time, these programs will deliver functional features to make daily computing tasks easier.

Chang Labs, like other software developers, requires great tools like the Amiga if we are to develop new programs with the speed, resolution and communication capabilities that will raise our products above the ordinary. Without such superior tools, we are no better off than the piano virtuoso who vainly tries to create the same timbre, resonance and sublety with a broken-down honky-tonk upright that he raises from a Steinway grand.

Chang Labs creates accounting software solutions for small businesses. Traditionally, accounting has proven the most difficult business application to communicate to others, so our task has been a challenge.

With our IBM PC version of *Rags to Riches* (Chang Labs' best-selling small-business accounting series), we achieved speed. Because the package is RAM-based, the results of each transaction can be seen instantaneously on screen. With our Macintosh version of *Rags to Riches*, we went one step further and added visual impact. Because the package is window-based as well as RAM-based, records and instant results are always available on screen. Both accomplishments, we believe, have eased the users' ability to comprehend accounting. *Rags to Riches*, introduced in the fall of 1984, jumped into the top ten in accounting software retail sales this past spring, according to a national survey conducted by Eastman Publishing for *Computer Merchandising* magazine, an industry trade journal.

The Amiga's future impact on accounting software will rest primarily in its new standards of visual communication—speed, graphics and color (and overlapping color). As we all know, most people respond easier to graphics than to wordy text.

All of the Amiga's features are intertwined, however. As software developers, we will be tested to our utmost to communicate ideas through graphics based on speed. For example, if bringing a picture up on a computer screen takes four seconds, the visual image is no longer an effective communication device because of its slowness. (Believe me, four seconds is an eternity to veteran computer users.)

On the other hand, if the computer draws a complex picture in .1 seconds—and in color to boot—then the visual image brings a new, positive dimension to communications between you and your computer.

Don't mistake pictures for tiny icons or Donkey Kong in 96 shades of every color of the rainbow. In business applications, think of pictures in terms of a single invoice among 2,000 other invoices stored in your computer's memory. Then think of putting that single invoice on your screen in .1 seconds and with such high resolution and color that you can quickly understand the information before you.

That is the promise the Amiga holds! Animation capabilities extend this new machine's visual impact even further. Animation communicates without sound and words by drawing your attention to critical factors showing cause and effect.

The Amiga's sound capabilities hold the most exciting potential for fulfilling the expectations of the computer user. Unfortunately, speech is the area of computer science hardest to understand. We are, however, plunging headlong into discovering how to integrate speech capabilities into our products with meaningful, easy-to-understand results.

The Amiga is a milestone in personal computing. It will attract thousands of software developers who will create the next generation of exciting, easy-to-comprehend applications. From them will emerge the Amiga software virtuosos—imparting their knowledge and interpretations of the personal computing world through sound, speed, color and graphics.

investments and stocks, multiple-income families. . . just about anyone could gain from an accounting package, even if it does nothing more than make you aware of your financial status. This does not mean that going out and buying an accounting package to run on your Amiga is going to turn your life around or fatten your bank balance overnight, but there are very few people in the world who can keep track of all their financial responsibilities in their heads.

Accounting software is a form of checkbook on disk. If you can't be bothered to keep your records on paper, then computerizing your books isn't going to do you a whole lot of good. If, however, the reason that you couldn't do it on paper was a question of time alone, then putting your books on a computer might be just the thing for you.

Computers were meant to make things easier for humans—not do everything. They still can't read minds or walk through the warehouse and take inventory at the end of the year. Any accounting package is only as good as the data entered. But, if you can keep entries fairly up to date (and that doesn't mean rushing to the computer the moment you make a sale or write a check) and would rather let the computer do a lot of the work for you, then it is probably a good idea to look into accounting software. A good package should let you figure your net worth, track the profitability of your business, keep records for tax time, provide an audit trail, help locate problem areas, print out transaction reports and generally provide financial status information without too much pain and frustration.

What is Accounting Software?

As mentioned above, a good accounting package should provide you with a method of keeping track of your financial status, whether it is the income status of the investment property you bought last year or the status of your burger-in-a-basket restaurant. One of the biggest problems that many small businesses run into (and you can think of anything more than a single paycheck each week as a small business) is making the transition from checkbook accounting to something a bit more sophisticated. You may have financed your business out of your savings, but sooner or later, you're going to want a loan from a bank or investors, and they are going to want some cold, hard reasons for giving you money. And even if you never intend to borrow money, you will have to fill out an income tax form every year, and an accounting package can make April 15th a little easier to face.

A minimum accounting system is a general ledger that tells you how much money you are making (or losing) by keeping track of where your money is coming from and where it is going. It should also provide a balance sheet showing assets, liabilities and net worth and an income statement or profit-and-loss statement. Like a database, an accounting program has to be set up with a "chart of accounts" before you can dive in and start entering sales records and check numbers and printing invoices.

Most accounting software comes with a number of different modules to cover various business applications, such as accounts receivable, accounts payable and sales, which may all be separate modules. If you are going to need some or all of these types of programs, be sure that they can all work with the same information, or you may end up doing a lot more data entry than you anticipated. You should also be certain that the package you decide to buy will be able to expand with your business. (You do expect your business to expand, don't you?) And probably the most important feature in any accounting package is its flexibility. The software isn't going to do you much good if it can only keep track of 90% of your income or accounts, and the odds are excellent that your business is unique in some way. Be sure that the software is easily modifiable to suit your specific needs.

Why Accounting Software?

There are a number of reasons for considering accounting software for your Amiga. The best reason is that you know what it can do to save time and money. Good accounting software is better than seat-of-the-pants bookkeeping. It should let your business grow without too much strain and even help your business grow by providing detailed information about the status of the business. If you can accurately track where you are spending the most money or making the most money, then you should be able to capitalize on that information.

> *Just about anyone can gain from an accounting package, even if it does nothing more than give financial status information.*

Taxes are simplified when you can get a printout of all income, expenses, loans, debts, etc., all in a nice, neat report generated at the end of the year. By providing an audit trail, an accounting package might keep you out of jail (or put you in one), but an audit trail can also be used to find discrepancies, mistakes and even employee crime. You should also save money on accountants' fees. By seeing the bottom line of your venture, you may discover that you are better off than you thought, or that it is time to quit.

Obviously, there are thousands of reasons to think about accounting software, and for many people, the only reason to think about buying the Amiga computer is that there is good accounting software available for it. In some cases, the software alone is going to make the purchase of an Amiga worthwhile, and the fact that

Computerizing Small Businesses

Rags to Riches *Accounting Software Developer Advises Computer Novices On How to Select Software Packages*

This grim scenario has unfolded too many times in the past: An uninitiated small-business owner spends a few thousand bucks for an expensive personal computer system, pours in hundreds of dollars more for highly complex software and shells out another grand for installation and training. Then, at the moment of truth, he discovers that the new system won't do the work it was supposed to do.

The expense problem has been solved with the arrival of the Amiga. Now small-business owners finally have a computer they can call their own, and it sells at a small-business price.

But what about the software, the programs that make the Amiga perform its feats of magic? How can you, the small-businessperson, find the right software for your exact needs?

First-time computer buyers are the most susceptible victims of software "overbuying" or "wrong-buying." But with thousands of software programs on the market (some estimates put the number of titles at more than 30,000), where does the novice go to get reliable information?

Chang Labs, developer of the *Rags to Riches* small-business accounting series for the Amiga, suggests five dependable sources:

- Colleagues in your field, who already have computerized their businesses.
- Your business trade journals, which often publish articles about computerizing.
- Computer trade magazines, which continually spotlight new software programs.
- Libraries and bookstores, which are stacked with computer books of almost every ilk.
- Amiga computer outlets, where experts specialize in packaging the right business software solutions.

To address the needs of small businesses, Chang Labs, headquartered in San Jose, California, decided to publish its own series of "How to Computerize" books exclusively for small-business owners.

"Until recently, our industry virtually ignored the small-business market in favor of the Fortune 1000, education and home markets," admitted Darhsiung "Dash" Chang, founder and president of the company that bears his name.

"Surveys show that only a few of America's millions of small businesses have computerized their accounting procedures, and it's the industry's fault. We have failed to educate small business about the benefits of computerizing. And this is in spite of the fact that a Dun and Bradstreet survey showed that the number one software application for businesses with 100 or fewer employees is accounting."

Chang Labs has already published three "How to Computerize" books and is currently distributing them to small-business owners through its 1,200-strong nationwide *Rags to Riches* dealer network.

"We believe our grass-roots educational campaign is the most effective way of explaning how computers can benefit small businesses," Chang said. Current titles in the Rags to Riches "How to Computerize" library are *The Service Business Management Guide*, *The Retail Business Management Guide* and *A Personal Finance Guide*, with suggested retail prices of $9.95 to $14.95 each.

"Our three 'How to Computerize' books address the immediate needs of a myriad of small businesses, including service and retail businesses, professions, small manufacturing plants, farms and ranches, consulting firms, home-operated businesses, warehouses—any small business," Chang said. The books are written with humor and in layman's language so the prospective computer owner doesn't have to be an accounting whiz or a computer buff to understand them.

Chang concluded, "The small-business market is emerging; it's just a matter of time before one small-businessperson tells another who tells another and so on... until every small-business owner discovers he can benefit from computerizing just as big business realized long ago."

the Amiga can do things other than accounting is just a bonus. Use the accounting software to keep track of everything, a word processor to write reports, the graphics to show how things are going in the business and a modem to both gather and send out information.

It's not hard to imagine an entire business based on one or more of the capabilities of the Amiga computer...let's say, a graphic artist or an advertising agency that uses the Amiga's graphics, animation and sound along with an accounting package to keep their

Shop carefully, analyze your needs and hope for the best. You have a great computer to start with, and if you bought it strictly to run your business, then it's tax deductible!

books. Their reports, business letters, bills and invoices can be generated by the Amiga; it can even entertain executives after hours. This may seem like a bit much, but consider all the small businesses that are going to be using one or more of the Amiga's everyday features and the businesses that will spring up because of those features that are unique. Each of those small businesses will have to keep accounts of some sort, and since they will already have the machine, for a small extra expense they can make the Amiga that much more useful. Even the rock band that uses the Amiga's sound and music features will need to keep track of income, expenses, equipment, etc.

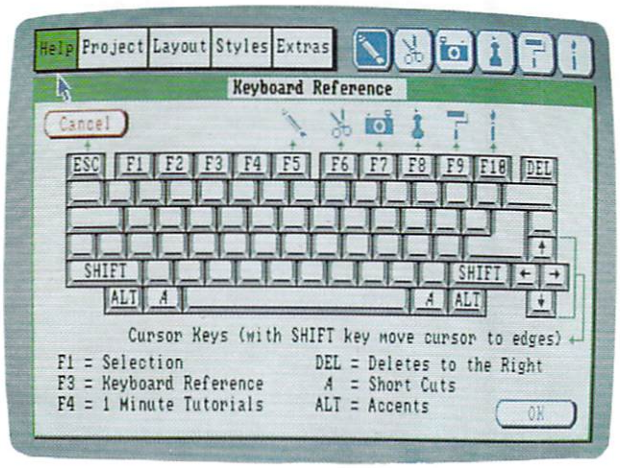
Obviously, we haven't covered all the bases here. A lot could be said about things such as awareness of how revenues are booked (earned, accrued, etc.) or how a particular piece of software handles credit, the differences between single-and double-entry bookeeping systems, or the number of accounts that a package can handle, etc. Above all, remember to shop carefully, analyze your needs and hope for the best. At least you have a great computer to start with, and if you bought it strictly to run accounting software for your business, then it's tax deductible!

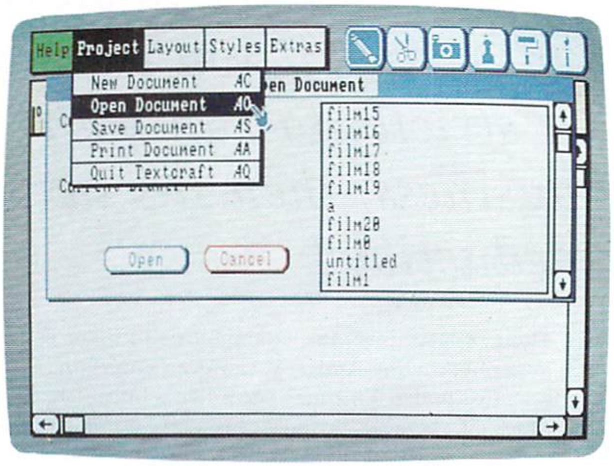
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Textcraft

Ease of use and flexibility highlight Arktronics Corporation's Amiga word processor.





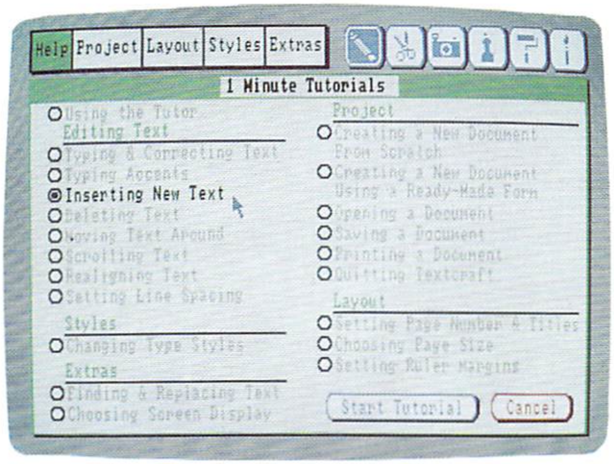
	Textcraft
Developer:	***Arktronics Corporation*** 520 East Liberty St. Ann Arbor, MI 48104
Publisher:	***Commodore-Amiga, Inc.*** 983 University Ave. Los Gatos, CA 95030 408/395-6616
List Price:	**$99.00**

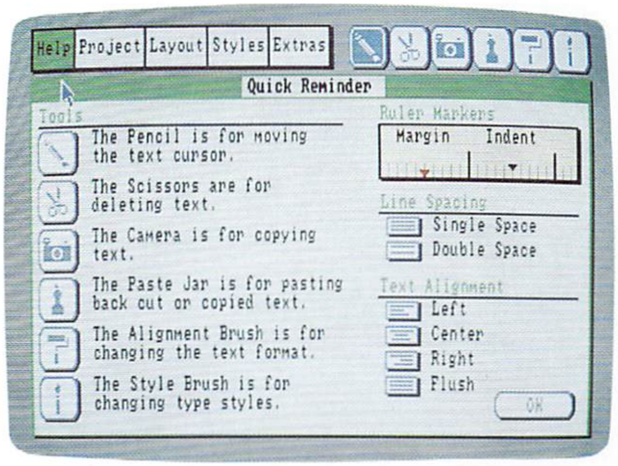
A word processor is a pretty straightforward piece of software. You should be able to enter text on the computer keyboard, edit the text, save and load it on disk, and finally send it to a printer. Everything beyond that is extra. There is a snobbery about word processing, implying that the more features you have the better. But if you ask someone who uses word processors every day, you will find that there are only a few basic editing and formatting commands necessary to make a word processor useful.

Sometimes the more commands a word processor contains, the harder it is to use. With so many things to remember, it can take months of familiarization before you can type without the manual on your lap. Yet, no matter what the word processor is, a computer isn't a computer unless there is a word processor for it, and that word processor had better be flexible enough to cover most of the bases.

Almost no one needs all the features of a complicated word processor, but if your particular program doesn't do that one thing you need for a particular job, then it isn't enough. A novelist may never need to enter text in columnar form, but he must be able to print extra long documents in double-spaced format. Some people can't spell their own names without a spelling checker; some can't remember six commands, let alone sixty. Some people don't care what a letter looks like until it comes out of the printer, while others need to see each page on screen exactly the way it's going to print. Some will want to use a word processor strictly to send text over a modem, while most people will need a word processor that will work with their particular printer (and there are hundreds of different printers out there that each need their own peculiar control codes and signals in order to work at all).

The main points of any word processor are that it be flexible enough to handle most word processing jobs, yet simple enough to learn in a relatively short period of time. It should be able to work with almost any kind of printer, from a thermal dot matrix to an expensive laser printer. It should have the features that you need, like telecommunications capabilities, a spelling checker or a feature for merging with other





Screens from left to right: Keyboard Reference help screen; Project menu; help screen of One-Minute Tutorials; help screen showing icon uses.

software (such as a database manager or spreadsheet).

Textcraft from Arktronics has been called an entry level word processor, but it does just about everything that you could want from an "advanced" word processor (plus a few things that most other word processors can't do). It's main feature is its ease of use. Without reading the manual, there are enough on-screen help files so that anyone should be able to start writing in less than half an hour. It is straightforward and simple to use, but it has the flexibility necessary in any good word processor. It makes extensive use of the Amiga's windowing capabilities, and the commands are easy to remember. Nevertheless, if you forget something, there is a help menu that will give you quick reminders, keyboard commands and 21 different one-minute tutorials covering just about all aspects of using *Textcraft*.

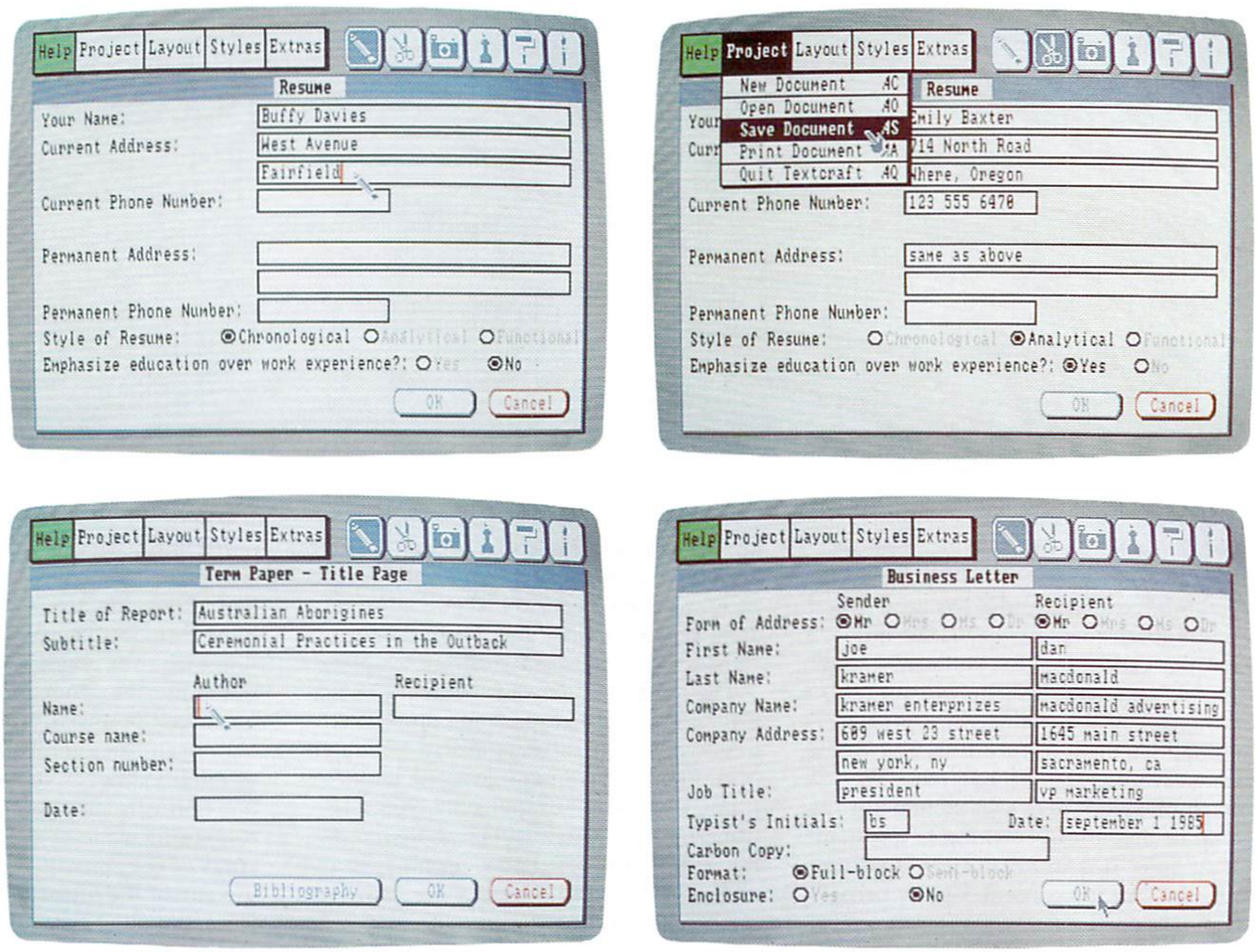
Running through the tutorials will give you a working knowledge of *Textcraft*, but I wouldn't throw away the manual until you have had a chance to really explore. There are numerous options that people who are familiar with word processors will recognize, and their inclusion will be appreciated. Where *Textcraft* goes beyond other word processors is in its writing templates.

The templates, or ready-made forms feature, is an idea that made me think, "Why hasn't any other software designer thought of this before?" You are given six basic forms, each with variations that you select from: business letter, memorandum, technical report, business report, term paper and resume. (The resume form alone makes *Textcraft* worth the price.)

When starting a new document, you are asked which form you would like (including blank). After supplying some information like names, addresses, etc., *Textcraft* arranges the information in the proper format. Business letters are organized cleanly and easily so that the content of the letter—not the format—is your main concern. Technical reports, business reports and term papers give you blank forms for bibliographies (both book and article references). The resume form lets you pick whether to emphasize work over education and whether you would like the resume to be chronological, functional or analytical in nature.

You can use the forms exactly as they are or modify them as you wish. Their main function is to give you a framework when composing some of the more common kinds of documents. You may never need to use any of the forms more than once or twice, but all of us could use some helpful reminders when writing.

►



Screens clockwise from top left: Resume template; saving a document from the Project menu; Business Letter template; Term Paper template.

◀ *Textcraft* is not the ultimate word processor, and it wasn't designed to be. It is a general-purpose, easy-to-use word processor that will satisfy 90% of the people who buy it. It has the advantage of simplicity without the usual accompanying limitations.

It can, of course, do the standard things that other word processors can: insertion, deletion, format changes, search and replace, block moves, set margins, line spacing, right and left alignments, centering title and page numbering, 60- or 80-column display, print, save, load, etc. It also has special features like international characters and accent marks, preset templates and type styles (bold, italic, underline, super- and subscripts, or any combination of these). All of these features are right at the click of a mouse button; or, if you don't like to take your hands off the keyboard, you can access them without the mouse.

Unless you are looking for a particular, more advanced feature, *Textcraft* will not be a disappointment. It is a very good program that will help turn your Amiga into the instrument for productivity and creativity that it was designed to be.

GSW

Help Key

By Swain Pratt

Help Key seeks to provide answers to questions about the Amiga computer that new users or other interested computerists are most likely to ask. Rob Peck, Director of Descriptive and Graphic Arts at Commodore-Amiga, answered the questions in this installment. If you have questions about the Amiga that you don't find covered here or in other articles in AmigaWorld, *send them in to* AmigaWorld *editorial, 80 Pine St., Peterborough, NH 03458, and we'll do our best to give you satisfactory answers.*

Q: Is every add-on peripheral going to be external, or will there be boards or modifications that require opening up the computer?
A: At the present time, all the peripherals (and memory expansion) can be added without opening the box. The sales and marketing people will probably discourage opening the box at all. The expansion connector on the side of the unit brings out almost every function that anyone could want. The complete bus of the 68000 processor is available there, as well as several special-purpose signals.

Q: What is the difference between a custom chip and a coprocessor?
A: Generically, a custom chip is a set of circuitry that has been designed for a special purpose. It could be anything from a memory circuit to a special-purpose logic circuit, or something that just makes a connection from one place to another. A coprocessor is something that operates with its own complete set of commands at the same time that another processor is running in the same system. The Amiga has a processor that does share the memory bus with the 68000 and controls the special-purpose chips.

Q: The 68000 chip is sometimes described as a 16/32-bit processor. Which is it? 16 or 32?
A: It is a 32-bit processor, meaning that it handles data in 32-bit chunks; however, it is a 16-bit data bus, which means that the pathway to the memory is 16 bits wide. If the processor wishes to handle a 32-bit-wide piece of data, it must do so in two separate instructions or data batches.

Q: Can you run both a 3½-inch and a 5¼-inch drive at the same time with the Amiga?
A: Yes. The drives can be daisy-chained off the back of the unit.

Q: Which 5¼-inch drives will work with the Amiga?
A: The only 5¼-inch drive that will work with the Amiga initially is the A1020, made by Commodore-Amiga. It is a double-sided, double-density drive with a formatted capacity of 360K bytes. It reads and writes disks in standard IBM-PC format and features an Integral power supply.

Q: Can the Amiga do batch processing?
A: You can direct the machine to execute a text file in order to do batch processing. A facility built into the command-line interface (CLI) allows you to build a command-instruction stream using the editor.

Q: Will the Commodore 1702 and 1902 monitors work on the Amiga?
A: We are using 1902s on the machine at the moment, but I'm not sure how well the 1702 would work.

Q: What should a user look for in buying disks for the Amiga?
A: Just look for 3½-inch, double-sided microfloppy disks. Macintosh disks, as Macintosh standards are at the moment, will *not* function in the Amiga drive, because they are only certified as single-sided. They must be double-sided for the Amiga—there are no other specifications. We have preferences, but do not have recommendations.

Q: How is information stored, as to tracks, sectors, and so on, on the Amiga's 3½-inch disks?
A: It is stored at 11 sectors per track, each sector containing 512 bytes. The disks are double-sided, 80 tracks per side, so there are approximately *880,000 bytes* available per disk.

Q: What does the phrase "open architecture" mean?
A: Open architecture refers to a system designed so that people will be able to develop other peripherals to attach to it. If a computer is designed with open architecture, it usually indicates that the manufacturer is interested in encouraging people to attach other products to it; a closed architecture means that the manufacturer is providing the add-ons that it feels everybody will want, making it difficult for other people to design things that will work effectively with the machine. Far from discouraging add-ons, Commodore-Amiga is actively encouraging them. If there is a particular peripheral that people become very interested in, for example, they will probably buy the Amiga just to have that add-on.

Q: Is there a way you can network a number of Amigas together?
A: Since the Amiga includes a serial and parallel port, there will be ways of doing this. Telecommunications options for the Amiga will be introduced in 1986.

Q: Who wrote the operating system for the Amiga?
A: The fellow's name is Carl Sassenrath. He wrote the Executive, which is the low-level multitasking system. The disk operating system, AmigaDOS, which makes use of the Executive, was written at Metacomco. *(See our article on Metacomco, p. 70, in this issue.—Eds.)*

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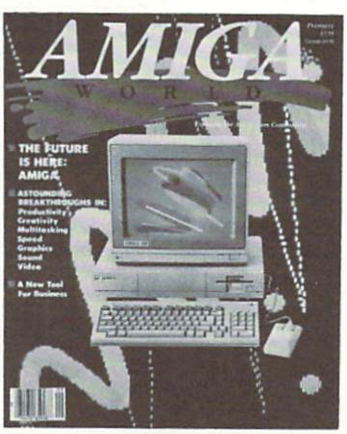
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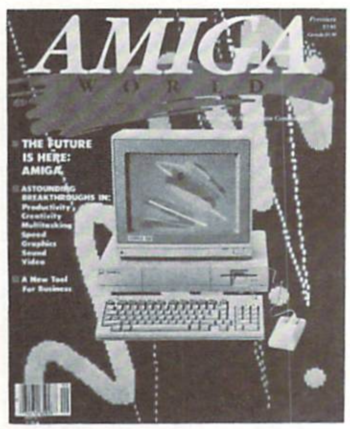
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☐ 1. Yes ☐ 2. No

B. Do you intend to purchase one?
☐ 1. Yes ☐ 2. No ☐ 3. Maybe

C. What microcomputers do you currently own?
☐ 1. Commodore ☐ 2. Radio Shack ☐ 3. Apple ☐ 4. IBM ☐ 5. Atari ☐ 6. Other (Please Specify) ________ ☐ 7. None

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Amiga makes charts and graphs with more color and dimension than any other personal computer (and faster than most of them). But that's just a start. You can prepare presentations with stereo music and animation, slide shows, create package designs, instruction manuals, brochures.

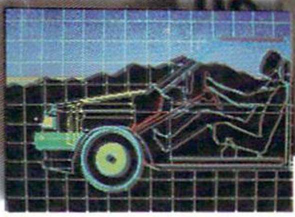
Amiga can not only do many more tasks, it can do more of them at once. And work on all of them simultaneously. While you're preparing the spreadsheet, Amiga will print the memo. And there's probably enough power left over to receive a phone message or a stock quote over a modem at the same time.

You won't find a computer that's easier to use, either. You point at symbols with the mouse or use keyboard commands if you prefer. Only Amiga is built to give you a choice.

Amiga has twice the memory of an IBM® PC. But although it can run rings around IBM, it will also run IBM programs. You have instant access to the largest collection of business software in the industry, including old standbys like Wordstar® and Lotus® 1,2,3. Amiga is more powerful than Macintosh,™ too, and more expandable. With an optional expansion module you can add memory up to 8 megabytes. And while it can do much more than Macintosh or IBM, Amiga costs less than either of them.

See an Authorized Amiga Dealer near you. Now that Amiga is here, the question isn't whether you can afford a computer, it's whether you can afford to wait.

Amiga by Commodore



Amiga can help you design anything, from autos to atoms.



Like you, Amiga can do many things at once.



Amiga's color graphics leave the competition far behind.



AMIGA GIVES YOU A CREATIVE EDGE.